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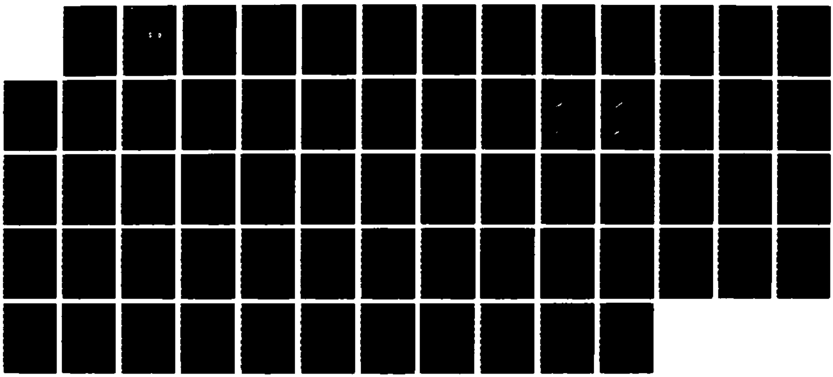

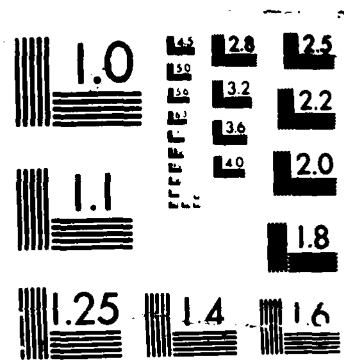
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AD-A180 268

Validation of the OPAQUE Data From the US/FRG Meppen Site: September 1978 to March 1980

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13 May 1986

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Under the OPAQUE Program, visible and infrared transmittance and supporting meteorological data were taken around the clock at seven sites in Europe over a period of several years. This report describes the validation of the data taken at the US/FRG site near Meppen from Sept. 1978 to March 1980. Validaltion consists of two parts: editing and recalibration. First the data is edited to remove invalid data and to assign reliability values. Secondly, the IR transmittances are recalibrated based upon calculated transmittances during periods of high visibility. Several unexplained anomalies in the data were discovered and are discussed.

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INTRODUCTION

The OPAQUE program consisted of measurements of IR and visible transmittance, visible scattering, temperature and dew point and various other atmospheric parameters taken continuously over a period of several years at seven locations in Europe. The program was a cooperative venture between eight NATO countries. The US participation consisted of a joint effort between the Air Force Geophysics Lab (AFGL) and the Ministry of Defense of the Federal Republic of Germany (FRG) to operate a station near Meppen, FRG. The purpose of the program was to develop a data base of visible and IR propagation measurements supported by other atmospheric parameters all of which are of importance to the performance of electro-optical military systems.

After the data were taken, they were reduced and entered into a file containing hourly values of the various parameters. As a final step in the reduction process, the data have to be reviewed for correctness and reliability factors for each measurement must be assigned. When this step is completed, the data will be sent in a standard format to a central Data Bank where they are archived for future use.

This report describes the work that was performed in order to verify the OPAQUE data taken at the Meppen station between Sept 1978 and March 1980.

1.1 ORGANIZATION OF THE REPORT

Section 2 describes the data to be reviewed and the programs used for this purpose. Section 3 details the review and edit cycles required to process the data. Section 4 summarizes the results including problems and anomalies encountered and Section 5 presents the conclusions.

2

DESCRIPTION OF THE TASK AND THE DATA

2.1 DESCRIPTION OF THE TASK

This task involves verification of visible and IR transmittance data taken under the OPAQUE program at the US/German Station near Meppen in the FRG. For this field test, around the clock measurements were made of a large number of atmospheric parameters, including visible and IR propagation, aerosol characteristics and meteorological variables. The raw data have been processed into a data set containing hourly values of the various parameters. Each measured value has an associated quality or reliability value.

The particular measurements to be reviewed here are described in Table 1, along with the corresponding reliability words. The reliability code is given in Table 2. In addition, the station number (word 1) and the comment numbers (words 5 through 9) are to be set according to the format in Appendix A.

The review process consists of looking at plots and printouts of the data to determine data which are invalid or of reduced reliability and changing the reliability word to the appropriate value. Examples of invalid data are: values for a single channel which remain constant for extended periods when the other measurements change or sudden spikes or dropouts in one channel not seen in any other. The reliability may be reduced if, for example, either the calibration of an IR measurement is based upon a period for which there are few or no high visibility points, or when one channel shows a much larger variability than other similar channels.

After eliminating invalid data, the IR measurements are calibrated by comparingthe measured transmittances with transmittances calculated using a parameterization of LOWTRAN 3B [1] for conditions of high visibility. Periodic recalibration is necessary due to changes in the system's response to the Barnes transmissometers due to maintenance, realignment, or other obscure changes.

2.2 GOVERNMENT-PROVIDED DATA AND SOFTWARE

The government provided the OPAQUE data from the US/German station for the period September 1978 to March 1980. The data were in the form of permanent files on the AFGL CYBER computer system; one file per month. Table 3 lists the government-supplied computer programs used to read and edit the data. These programs were provided in the form of FORTRAN source code.

1. Shettle, E. P., private communication, 1986

Table 1. Data Words To Be Reviewed and Edited

WORD	PARAMETER
1	Station Number = 7x (7 = Meppen, x is the version number of the data file)
5	Comment Number (See Appendix A for the format)
6	" " " " " " " "
7	" " " " " " " "
8	" " " " " " " "
9	" " " " " " " "
53	500 m Barnes Transmittance, 3-5 micrometers, beginning
54	" " " " " , 8-12 "
55	" " " " " , 8-13 "
56	" " " " " , 4 "
57	" " " " " , 3-5 " , ending
64	1400 m Barnes Transmittance, 3-5 micrometers
65	" " " " " , 8-12 "
74	Temperature Reliability
75	Dew Point Reliability
77	1400 m Barnes Reliability
78	Eltro Visible Transmissometer Reliability
79	AEG Point Visibility Meter Reliability
84	500 m Barnes Reliability

Table 2. Reliability Code Values for Optical/IR Transmittance Data (from [3])

Code	Definition
FIRST GROUP - No data available	
0	No data, because the instrument was not working (for at least 2 weeks; for a shorter period, use 1)
1	(a) No data, because the instrument was not working temporarily (up to 2 weeks) or (b) The relative error of the data is greater than 50 % (15% absolute error for the IR transmissometer)
SECOND GROUP - The relative error of the data is below 50 % (IR transmissometer 15% abs), i.e. not good for detailed case studies, but useful for statistics.	
2	Quality assumed to be below normal standards, but the data have not been checked.
3	Quality below normal standard, caused by measurement circumstances (e.g. sun facing the instrument or fluctuating light) or known by detailed knowledge of the specific instrument (e.g. noise at low signal levels), or proven by bad calibration results.
THIRD GROUP - The relative error of the data is below 15% (IR transmissometer 5% abs), i.e. useful for most purposes. All data are checked for obvious discrepancies (e.g. temporary interruption of the optical path.)	
4	Normal data quality, known from detailed knowledge, ever though it has been some time since the last calibration was performed, or proven by repeated calibrations.
5	Not used here.
6	" " "

Table 3. Government Supplied Computer Programs

PROGRAM	FUNCTION
QUALITY	Performs an initial screening of the visible and IR data by comparing the data against preset tolerance limits, and by flagging missing data.
UPDATES	Makes changes to the OPAQUE data files based on user supplied inputs.
FBARNCL	Plots the visibility and the 1400 m Barnes transmittances and the ratio of the measured and calculated values. Also prints out the average and standard deviation of the ratio for points with visibility greater than 10 km and separately, 20 km. Used both for data review and for recalibration
FBARNC5	Same as FBARNCL except for the 500 m Barnes transmissometer.
FQBARNS	Compares the measured and the calculated transmittances and flags any large discrepancies. To be run after the recalibration is complete.
FLISTOP	Reads the OPAQUE data files and lists selected words for selected periods.
FPROPQ	Lists all the data for each hour, one day at a time. To be run once at the end of the task to produce an archival record of the data.

3

THE REVIEW-EDIT CYCLE

This section describes the review-edit cycle applied to the OPAQUE data, potential problems in this process and the procedures established to ensure that the process was performed reliably and consistently.

3.1 PROCEDURE

A set of programs and procedures has previously been created for reviewing the data and recalibrating the IR transmittances. The programs were listed in the previous section. The procedure is described here briefly as follows:

1. The program QUALITY is run on the unedited data to perform an initial screening of the data. The output is a screened but unedited version of the data file.

2. The programs FBARNCL and FBARNC5 are run on the screened data to produce plots and print outs of the visibility, the IR transmittance for the various channels and the ratios of the measured and the calculated transmittances.

3. The transmittance and visibility plots are reviewed for periods of invalid data. These periods are recorded on paper.

4. The program UPDATES is run on the screened data: the inputs are the time periods and data reliability values (1 or 0) for the bad data identified in 3. The output is the new updated version of the data file and a list of the edits.

5. FBARNCL and FBARNC5 are run on the updated file produced by 4. The ratio plots are reviewed to check the calibration: points for which the visibility is greater than 10 km is connected by

lines and these lines should lie along the ratio of 1. Recalibration is necessary if these lines do not bracket the ratio of 1,if there are clear discontinuities in these lines,or if the station log reports that the system was realigned. Recalibration is performed by dividing all the transmittances by a constant factor. This factor equals the ratio of the measured to the calculated transmittances for points of high visibility and is chosen to force agreement between the measurements and the calculations under conditions of minimum extinction (ie high visibility). This factor is calculated by FBARNCL for points with visibility greater than both 10 km and 20 km. If 10 or more points with visibility greater than 20 km are present, then that factor is used. If fewer than 10 points are present, then the factor for the points with visibility greater than 10 km are used. If the period of recalibration is less than the whole month, then the FBARNCL program is run for the period of recalibration only. If the period of recalibration spans two or more months, then the average recalibration factor for the period is calculated by hand.

6. The program UPDATES is run again with the recalibration factors determined in 5.

7. FBARNCL and FBARNC5 are run again for the full month period. The plots are reviewed to ensure that the recalibration was properly performed.

3.2 POTENTIAL PROBLEMS

There were several potential problems with the existing procedures for review-edit cycle. First, as it is written, the program UPDATES is run interactively so that edits are entered directly into the data file. In this mode it is difficult to correct input errors before they are applied and also to recover from errors after they are applied. Secondly, the record of the cumulative edits applied to a file can easily become confused or ambiguous, as in the case where the UPDATES program is aborted or after UPDATES is run repeatedly on the same file.

Another potential problem involves overlapping edits. In a single run of UPDATES, edits to a given data word cannot overlap in time or the actual edit applied will be indeterminate. For example, suppose you want to set word 79 (Eltro reliability) to 3333 for a whole month to reflect a general deterioration in the quality but also to 1111 for a one day period where the data are present but bad. If both these edits were applied in a single run of UPDATES, the value of word 77 for the one day period would be randomly either 3333 or 1111 regardless of which edit was entered first. To apply the edits properly, the edit for the whole month has to be applied first, followed by the one day edit in a separate run of UPDATES. The possible conflict of overlapping edits must be kept constantly in mind when reviewing the data.

3.3 IMPROVED REVIEW-EDIT CYCLE

The review-edit cycle was modified as follows in order to prevent the problems mentioned in the previous section. All the edits generated for each month were stored in a database resident on an IBM PC compatible microcomputer. Associated with each edit was the cycle number it belongs to and the date it was entered into the database. To apply the edits to a file, a program is run which extracts the edits from the database in the proper order and then creates a batch job file on the AFGL Cyber to actually run UPDATES. The significant point here is that each time the program is run, the starting point is the screened but unedited data file and all the accumulated edits are applied. While this process repeatedly applies the same edits, the only cost is a small amount of computer time on the Cyber. The benefits are as follows:

1. Edits can be easily corrected or modified in the database.

2. The database keeps a complete and clear record of the edits applied to each month,

3. The edited data file is recreated in total each time the program is run so that there is no chance of confusion as to what edits have been applied to a file.

By convention, three edit cycles were established corresponding to three separate runs of the program UPDATES on each file. Cycle one sets the defaults for the comment words and sets the reliability value for missing or reduced reliability data when that value applies to the whole month. Cycle two sets the reliability for cases not treated in QUALITY, e.g. data present but bad (reliability of 1), data missing or bad for a period of two weeks or more (reliability of 0), or data of reduced quality (reliability of 3). Cycle three applies the recalibration factors to the 500 m and 1400 m Barnes transmittances (words 53-57 and 64-65 respectively). In addition, cycle three includes any reliability edits which cannot be in cycle two due to the overlap problem mentioned in the previous section. (Note: the edits for Sept. 78 through Nov. 78 are contained in only two cycles: cycle two contains both the reliability and the recalibration edits.) The complete list of edits is included as Appendix B.

3.4 PROGRAM MODIFICATIONS AND DEVELOPMENT

The programs supplied by the government were modified as little as possible. The only modifications made were to FBARNCL and FBARNC5 as follows:

1. The programs now plot the entire months worth of data on a single plot.

2. The programs now ignore the Eltro transmittance for the purpose of calculating the theoretical transmittance and for selecting the high visibility points for the period from Jan. 26, 1979 to Nov. 30, 1979 as discussed in a later section.

Otherwise the programs listed in section 2.3 were used as is.

The software developed for this project consists of the PC-resident database and a procedure on the AFGL Cyber to run the editing and plotting programs. The database resides on a Zenith-150 PC running Knowledgeman by Micro Data Base Systems. It includes the database tables and assorted programs to create, edit and query the database. There is a separate table for each month. Each record of a table corresponds to the edit for a single word for a single time period. The date and time each record was created is stored so that the history of the edits can be recreated.

4

RESULTS

4.1 DATA

The edit and recalibration procedure described above was performed for all the months from Sept. 1978 to March 1980. The list of the edits applied is included in Appendix B. The figures in Appendix C show graphically the availability and reliability of the data and also show the calibration factors. In these figures, changes in the reliability or calibration are shown only if the changes continue for 6 hours or more. Recall that a reliability of 1 indicates that the corresponding data are missing while 0 indicates they are missing for 2 weeks or longer.

4.2 GOODNESS OF FIT

A measure of the success of the recalibration procedure is shown in Table B-2. This table shows for each month and each filter the average of the ratio of the measured to the calculated transmittance, the standard deviation around the average and the number of points used in the average. Only cases with visibility greater than 20 km are used if there are 10 or more such cases, otherwise all cases with visibility greater than 10 km are used. (The visibility used is that measured by the Eltro visible transmissometer if available, otherwise the AEG is used. An exception is for the period from Jan. 29 1979 to Nov. 30, 1979 for which the AEG is used exclusively, as noted below). Ideally, the average should equal 1.00. Deviations of the average from one or less than one standard deviation are not considered significant. A standard deviation of 0.05 or greater indicates data of relatively poor quality and the reliability of such data is set to 3 for that month (see for example Jan. 1980, 1500 meters).

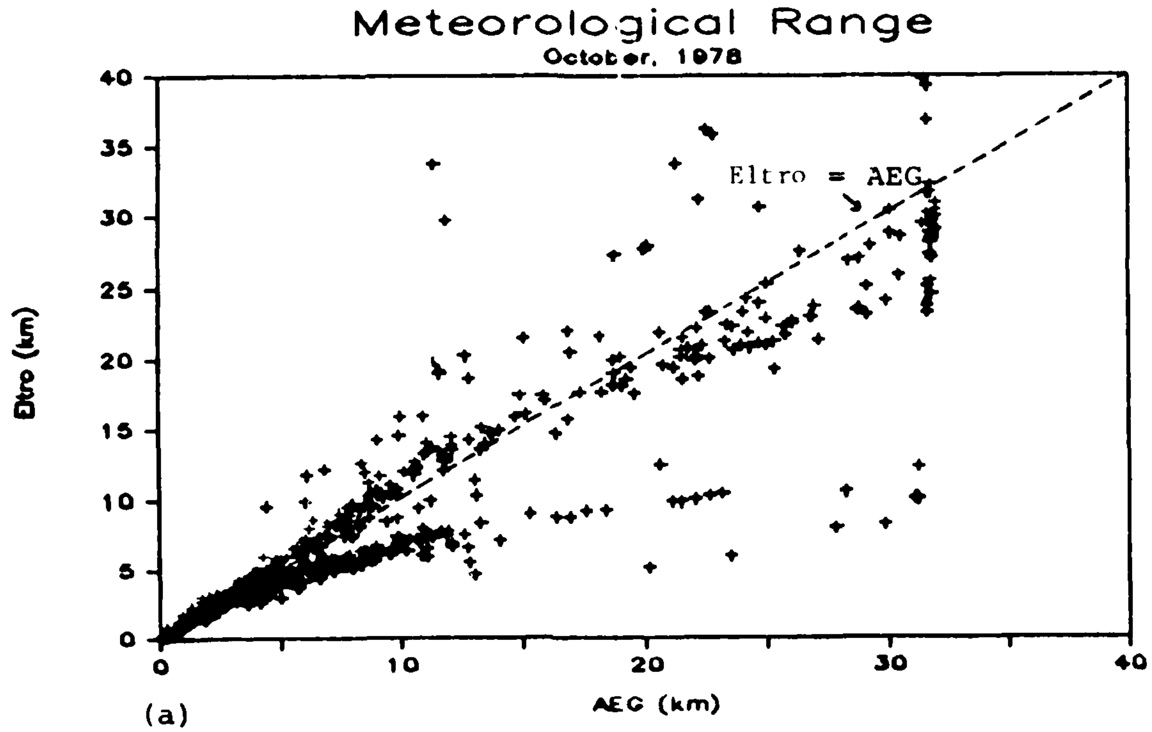
4.3 ANOMALIES IN THE DATA

Several types of anomalies in the data were discovered in the course of reviewing the data. The characteristics of these anomalies are described below, however the causes are not understood and require further analysis of the data.

4.3.1 ELTRO TRANSMISSOMETER DATA

On January 26, 1979 the Eltro transmissometer suffered an unspecified failure according to the station log. After January 29 when the Eltro transmissometer was restored, comparison of the visible transmittances measured by the Eltro transmissometer and by the AEG scatter meter showed significant systematic differences not seen before the failure. Figures 1-a. to e. show scatter plots of the meteorological range* for the two instruments for selected months in the reporting period. The first figure, for Oct.

* Meteorological range R (commonly referred to as visibility) is related to the transmittance T by R = 3.912/[log(T)/L] where L is the path length: R is related to the scattering coefficient E (assuming no absorption) by R = 3.912/E.



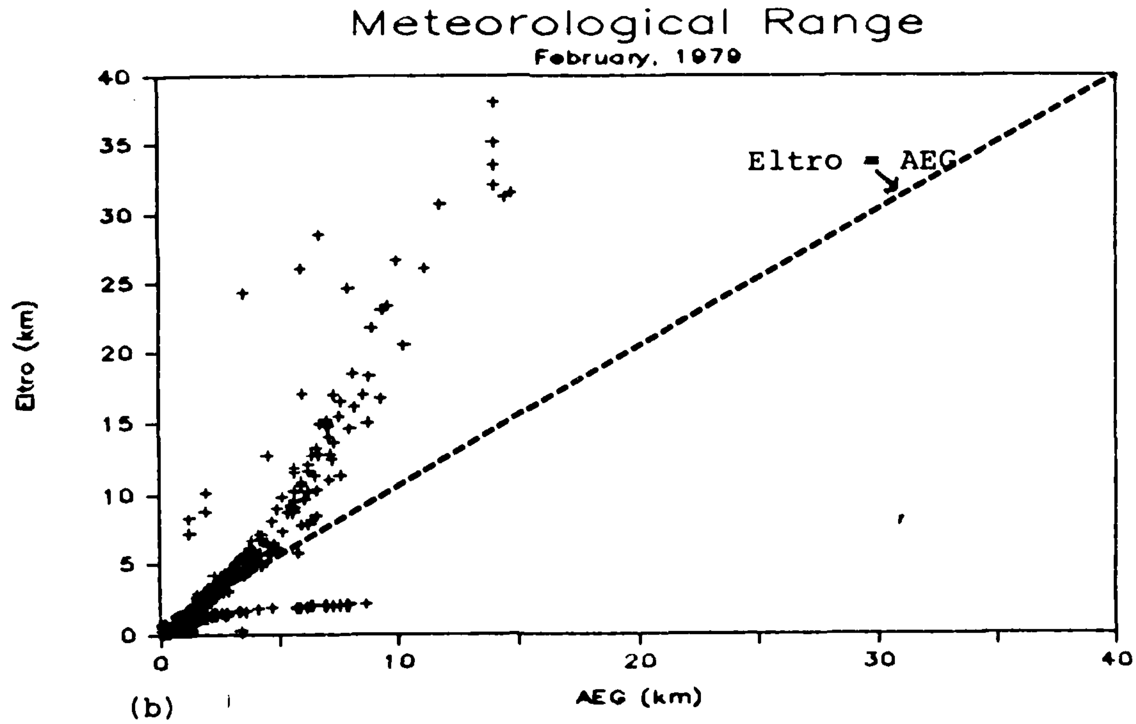
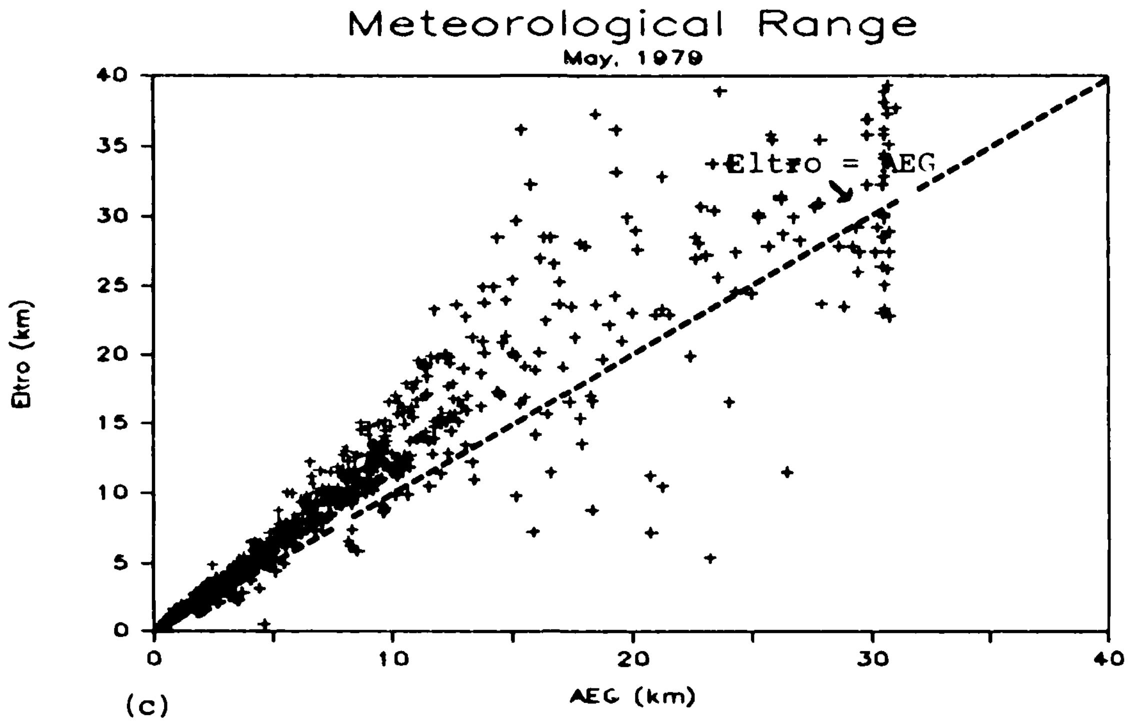


Figure 1. Scatter Plot of Meteorological Range, Eltro Visible Transmissometer vs. AEG Point Visibility Meter A. Oct. 1978 B. Feb. 1979



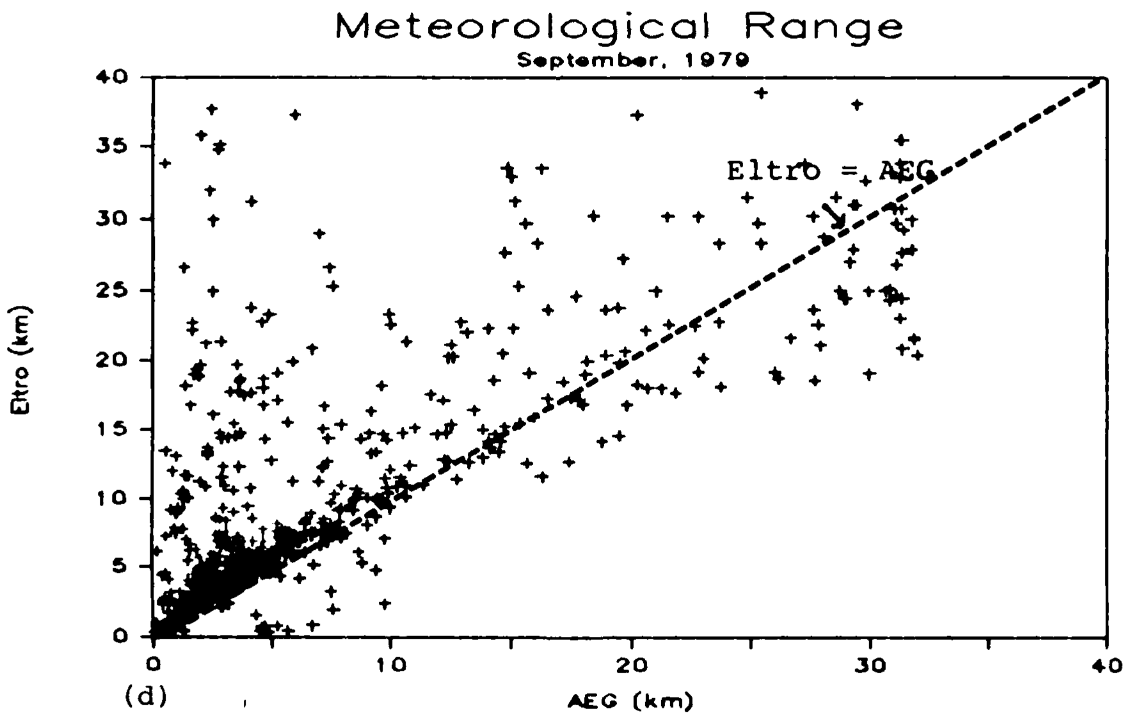


Figure 1. Scatter Plot of Meteorological Range, Eltro Visible Transmissometer vs. AEG Point Visibility Meter C. May 1979 D. Sept. 1979

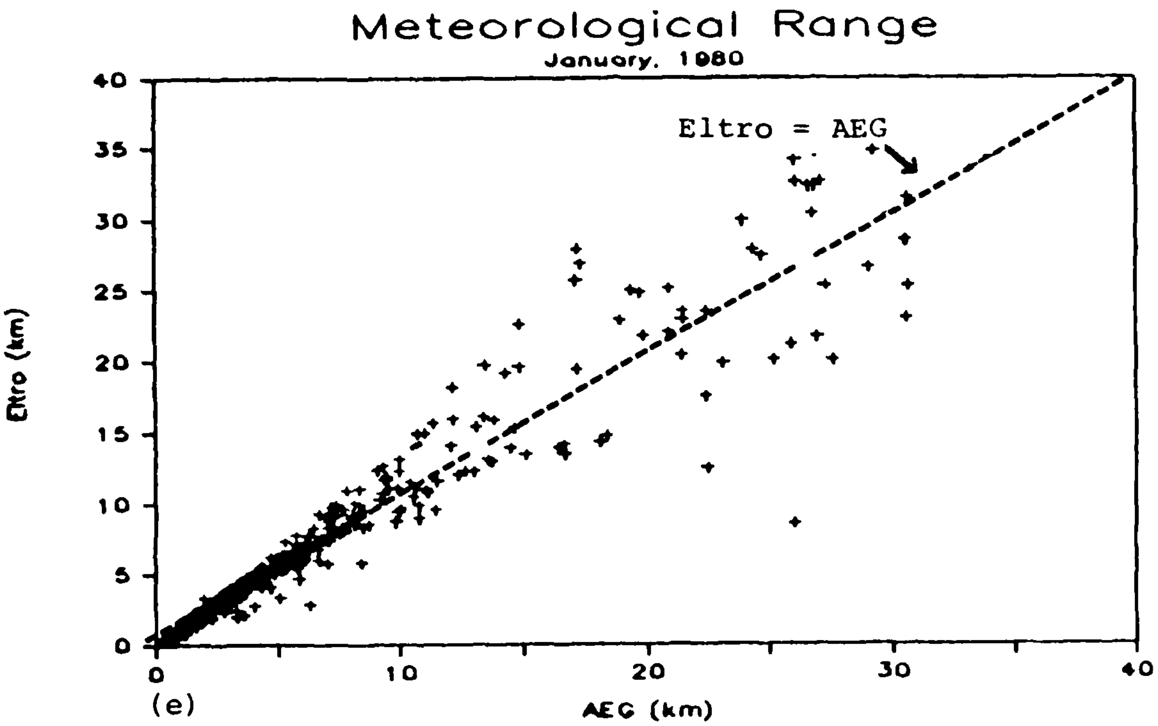


Figure 1. Scatter Plot of Meteorological Range, Eltro Visible Transmissometer vs. AEG Point Visibility Meter E. Jan. 1980

1978, shows a good correlation, apart from a distinct group of points* below the main body. The main body of points is centered around a line with a slope of about 1.0. The second figure, for Feb. 1979, shows a strongly nonlinear behavior with the Eltro measurements becoming much larger than the AEG for meteorological ranges above 5 km. Below 5 km the comparison is linear but the slope is about 1.4 In the figure for May 1979, the nonlinearity has disappeared but there is considerable scatter for ranges above 10 km. The figure for Sept. 1979 shows a great deal of scatter over the whole range of the data. Finally, the figure for January 1980 shows very good correlation centered around a slope of about 1.1. Visual inspection of the time plots of meteorological range from both instruments indicate that the discrepancies between the two were persistent between Feb. 1979 and Nov. 1979 (there are no Eltro data for Dec. 1979) but disappeared beginning in Jan. 1980.

These figures indicate an anomalous behavior on the part of one of the two instruments, but without a third independent measurement of the meteorological range, the decision as to which instrument is faulty must be based upon other factors. The factors include: correlations between the meteorological range and other measurements, in particular the IR transmittances; internal consistency of measurements and entries in the station log. Evaluation of these factors is subjective and not conclusive but appears

* The points included on these plots include some bad data which were subsequently edited out.

to indicate that the Eltro transmissometer was defective for the following reasons:

1. Visual comparison with the the IR transmittances seems to show better correlation with the AEG than the Eltro extinction.

2. Visual inspection of the plots of meteorological range for both instruments seems to indicate a higher degree of variability within the Eltro measurements along with more "bad" data, such as, transmittances unrealistically high (greater than 100 km) or constant over extended periods.

3. The station log indicates a failure of the Eltro on Jan. 26, 1979 but makes no mention of the AEG. The Eltro was out from Nov. 14, 1979 to Jan. 8, 1980: after it was reconnected on Jan. 8, the discrepancies with the AEG disappeared.

For these reasons we concluded that the Eltro transmissometer was defective from Jan. 29, 1979 to Jan. 8, 1980 and that its measurements were unreliable. Since the Eltro measurements did track the AEG and the Barnes measurements intermittently for long periods, the Eltro measurements were not deleted entirely, rather the default reliability was set to 3 for this period.

The Eltro meteorological range is used in the FBARNCL and FBARNC5 programs both as input to the LOWTRAN calculation, and to select the high visibility points suitable for use in the calibration. These programs were modified so that the AEG derived meteorological range was used instead for this period.

4.3.2 DATA ANOMALIES IN WINTER

During the winter months for both 1979 and 1980, the Barnes transmittance data show anomalies with the following characteristics:

1. The transmittance suddenly jumped up 5 percent or more over the background transmittance and stayed at the higher level for periods lasting up to several days.

2. The jumps were usually seen in both the 500 meter and 1400 meter measurements and usually but not always in both the 3-5 and 8-12 micrometer regions simultaneously.

3. These changes were uncorrelated with the visible transmittance.

4. The jumps showed some degree of correlation with the temperature. The jumps usually appeared when the temperature dropped below freezing and disappeared when it went above.

We can think of no logical explanation for this effect, particularly the correlation with subfreezing temperatures. We did not attempt to flag each individual episode with a reliability of 3 but instead indicated the broad periods including the anomalies with a reference to the comment sheet.

4.3.3 DATA ANOMALIES IN SPRING AND SUMMER

During the spring and summer months of 1979, other data anomalies appeared in the Barnes transmittances with the following characteristics:

1. The transmittance dropped suddenly by as much as 50 percent or more, lasting for as long as several hours.

2. The effect was seen primarily in the 1400 meter measurements but occasionally in the 500 meter data also.

3. The drops occurred during the late morning or early afternoon hours.

4. The drops show some degree of correlation with the solar illumination data measured by the Epply pyrheliometer, but no correlation with the visible extinction data from either the Eltro or the AEG instruments.

One possible explanation is that the drops are due to turbulence induced by solar heating of the ground. The magnitude of the effect (50 percent or more) however, is larger than would be expected from turbulence. No independent measurements of turbulence, either C_N^2 or C_T^2, were available for comparison at the time of this report. Another possibility is that the solar heating of the equipment causes temporary misalignment or other unknown changes in the transmissometer system. These dropouts have been flagged with a reliability of 1 for those episodes that can be clearly identified.

4.3.4 COMMENTS

The data anomalies described here have not been analyzed in any depth. Further analysis would be required to quantify the effects, in particular, the correlations with other measurements.

5

CONCLUSIONS

The visible and IR transmittance data from the US/FRG Meppen site have been checked and validated for the period from Sept. 1978 to March 1980. The invalid data have been flagged with the proper reliability values and the comment words set to the appropriate values. The complete set of data has been delivered to AFGL: from there it will be deposited into the OPAQUE data bank for use by other researchers.

In the course of reviewing the data, several types of anomalies in the data were uncovered for which there are no obvious explanations. These anomalies include: a.) a degradation in the quality of the Eltro visible transmissometer data for the period Feb. 1979 to Dec. 1979 b.) sudden increases in the level of the IR transmittance during the winter months, possibly associated with subfreezing temperatures and c.) sudden drops in the IR transmittances during the spring and summer months, correlated, at least partially, with solar heating. Data affected by these anomalies have been flagged with the appropriate reliability values.

REFERENCES

1. Shettle, E. P., private communication, 1986

APPENDIX A

FORMAT OF THE COMMENT WORDS

Words 5 through 9 of the Hourly OPAQUE Data Bank File are comment words which contain references to cover notes which are printed notes containing important comments and caveats regarding the data. Each word is a six digit code. For word 5, the codes correspond to the cover note reference number and the date of the data verification according to the following format:

Word 5: abc*def

abc - Cover note reference number (no note = 100)
def - Date the data was verified: d = last digit of calander year, ef = month (e.g. Aug. 1982 = 208)

For words 6 through 9, each digit (symbolized by a single character) corresponds to the one of the instruments as indicated below and can take on a value between 0 and 3. The definition of each value is as follows:

Value	Definition
0	No measurement
1	Data not verified
2	Data verified
3	Important caveat on this parameter is contained in the cover note.

APPENDIX A (cont)

The definitions of words 6 through 9 are:

Word 6: ghi*jkl

g	AEG point visibility meter
h	Eltro visible transmissometer
i	Horizontal Luxmeter
j	Vertical Luxmeter - North
k	Vertical Luxmeter - East
l	Vertical Luxmeter - South

Word 7: mno*pqr

m	Vertical Luxmeter - West
n	Night Path Luminance
o	VPFM - East
p	VPFM - South
q	VPFM - West
r	VPFM - North

Word 8: stu*vwx

s	Epply pyrheliometer
t	500 meter Barnes IR Transmissometer
u	Aerosol data
v	1400 meter Barnes IR Transmissometer
w	Laser turbulence
x	Barnes turbulence

Word 9: ABE*FGH

A	Cloud cover
B	Wind data
E	Temperature and dew point
F	Pressure
G	Rain Rate
H	Ground state

APPENDIX B

LIST OF EDITS

Table B-1 lists all the edits applied to the OPAQUE data for the period Sept. 1978 to March 1980 with the following exception: edits for the 500 meter Barnes transmissometer for Sept. 1978 to Nov. 1978 are not included since they were done previously.

The definitions of the various columns are:

Pass: UPDATES is run up to three times on the same data file; each run corresponds to a "Pass". In general, pass 1 contains default edits which apply to the whole month. Pass 2 contains replacement edits to delete bad data and pass 3 contains recalibration edits. (This convention does not apply to the first three months which contain only 2 passes.) Note also that two edits for the same word which overlap in time are not allowed within the same pass: the results are undefined.

Word: The data word being edited. See Table 1 for the definitions of each word.

Start, Stop: The starting and stopping day and hour over which the edit applies.

Replacement: This value replaces the current value of the corresponding data word.

Divisor: Recalibration factor: this factor divides the existing value to obtain the calibrated transmittance.

Table B-2 gives a measure of the goodness of fit of the calibration.

Table B-1. List of Edits Applied to the OPAQUE Data
These Edits are the Input to Program Updates

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
SEP	78	1	1	1: 0	30:23	76	
			5	1: 0	30:23	104603	
			6	1: 0	30:23	221111	
			7	1: 0	30:23	111111	
			8	1: 0	30:23	120200	
			9	1: 0	30:23	033010	
			77	1: 0	30:23	44	
SEP	78	2	55	1: 0	30:23		1.024
			64	1: 0	7:13		1.070
			65	1: 0	30:23		0.940
			77	1: 0	1: 9	11	
				5: 2	5: 8	11	
				7:14	11:16	11	
				11:17	12:10	33	
				12:11	30:23	00	
			84	6: 8	7:15	33333	
OCT	78	1	1	1: 0	31:23	76	
			5	1: 0	31:23	104603	
			6	1: 0	31:23	221111	
			7	1: 0	31:23	111111	
			8	1: 0	31:23	120200	
			9	1: 0	31:23	033010	
			77	1: 0	31:23	44	
OCT	78	2	65	1: 0	31:23		0.940
			77	1: 0	10:13	00	
				17:21	17:21	14	
				22:15	23: 8	11	
				27: 0	27: 0	41	
				29: 8	29:11	11	
				31: 0	31:23	11	
NOV	78	1	1	1: 0	30:23	76	
			5	1: 0	30:23	104603	
			6	1: 0	30:23	221111	
			7	1: 0	30:23	111111	
			8	1: 0	30:23	120200	
			9	1: 0	30:23	033010	
			77	1: 0	30:23	44	

Table B-1. (cont)

Month Year	Pass	Word	Start	Stop	Replacement	Divisor
NOV 78	2	64	9: 9	30:23		1.040
		65	1: 0	9: 9		0.940
			9: 9	30:23		0.900
		77	1: 0	1: 9	11	
			8:13	9: 9	11	
			17: 9	17:18	11	
			20:14	20:17	11	
			23:18	24: 9	11	
			24:11	24:11	11	
			28: 4	28: 9	11	
DEC 78	1	1	1: 0	31:23	75	
		5	1: 0	31:23	105604	
		6	1: 0	31:23	221111	
		7	1: 0	31:23	111111	
		8	1: 0	31:23	120200	
		9	1: 0	31:23	033010	
DEC 78	2	8	8:16	15:10	130211	
			21:15	29: 8	130211	
			30:15	31:23	120011	
		53	1: 0	30:15		0.975
		54	1: 0	30:15		0.989
		55	1: 0	30:15		0.975
		56	1: 0	30:15		0.998
		57	1: 0	30:15		0.975
		64	4:16	30:15		1.100
		65	4:16	30:15		1.000
		77	1: 0	4:15	11	
			6: 9	6: 9	11	
			7: 3	7: 3	41	
			7:21	7:21	14	
			9: 7	15: 9	11	
			30:15	31:23	00	
		84	8:16	15:10	33333	
			21:15	29: 8	33333	
JAN 79	1	1	1: 0	31:23	75	
		5	1: 0	31:23	105604	
		6	1: 0	31:23	221111	
		7	1: 0	31:23	111111	
		8	1: 0	31:23	120200	
		9	1: 0	31:23	033010	
		77	17:11	31:23	33	
		84	1: 0	31:23	33333	
JAN 79	2	6	29:10	31:23	231111	
		8	1: 0	17:10	130011	
			17:11	31:23	130311	
		77	1: 0	17:10	00	
			22: 9	22: 9	41	
		79	26:23	29: 9	1111	
			29:10	31:23	3333	

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
JAN	79	3	53	1: 0	29: 8		0.975
				29:10	31:23		0.850
			54	1: 0	29: 8		0.989
				29:10	31:23		0.930
			55	1: 0	29: 8		0.975
				29:10	31:23		0.940
			56	1: 0	29: 8		0.998
				29:10	31:23		0.890
			57	1: 0	29: 8		0.975
				29:10	31:23		0.850
			64	17: 0	29: 8		1.050
				29:10	31:23		0.976
			65	17: 0	29: 8		1.030
				29:10	31:23		0.989
FEB	79	1	1	1: 0	28:23	75	
			5	1: 0	28:23	105604	
			6	1: 0	28:23	221111	
			7	1: 0	28:23	111111	
			8	1: 0	28:23	120200	
			9	1: 0	28:23	033010	
			77	1: 0	28:23	33	
			79	1: 0	28:23	3333	
			84	1: 0	28:23	33333	
FEB	79	2	6	1: 0	28:23	231111	
			8	1: 0	21:16	130211	
				21:17	28:23	130311	
			74	9:22	12: 9	999	
			75	9:22	12: 9	999	
			77	1: 0	1: 9	11	
				2: 8	2: 8	11	
				6:12	6:12	11	
				7:11	7:13	11	
				12:10	12:10	11	
				12:22	21:16	11	
			79	9:22	12: 9	1111	
			84	21:12	21:16	11111	
				27:12	28:23	11111	
FEB	79	3	53	1: 0	23: 9		0.850
				23:10	28:23		0.850
			54	1: 0	23: 9		0.930
				23:10	28:23		1.000
			55	1: 0	23: 9		0.940
				23:10	28:23		0.970
			56	1: 0	23: 9		0.890
				23:10	28:23		0.950
			57	1: 0	23: 9		0.850
				23:10	28:23		0.850
			64	1: 0	23: 9		0.976
				23:10	28:23		1.040
			65	1: 0	23: 9		0.989
				23:10	28:23		1.050

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
MAR	79	1	1	1: 0	31:23	75	
			5	1: 0	31:23	106604	
			6	1: 0	31:23	221111	
			7	1: 0	31:23	111111	
			8	1: 0	31:23	120200	
			9	1: 0	31:23	033010	
			79	1: 0	31:23	3333	
MAR	79	2	6	1: 0	31:23	231111	
			77	12: 0	19:15	11	
				21:13	21:13	41	
				26:10	27:15	11	
				28:21	28:21	14	
			79	7:14	8:14	1111	
			84	1: 0	8:13	11111	
MAR	79	3	53	1: 0	31:23		0.780
			54	1: 0	31:23		0.810
			55	1: 0	31:23		0.840
			56	1: 0	31:23		0.810
			57	1: 0	31:23		0.780
			64	1: 0	31:23		0.940
			65	1: 0	31:23		0.870
APR	79	1	1	1: 0	30:23	75	
			5	1: 0	30:23	106604	
			6	1: 0	30:23	221111	
			7	1: 0	30:23	111111	
			8	1: 0	30:23	120200	
			9	1: 0	30:23	033010	
			79	1: 0	30:23	3333	
APR	79	2	6	1: 0	30:23	231111	
			8	9: 9	25:14	130211	
				25:14	30:23	120011	
			77	2:16	2:17	11	
				4:16	4:16	11	
				10:13	10:18	11	
				11:14	11:21	11	
				19:15	19:18	11	
				23: 0	30:23	00	
			79	23:22	24:13	1111	
			84	4:16	4:16	11111	
				9: 9	25:14	33333	

Table B-1. (cont)

Month Year	Pass	Word	Start	Stop	Replacement	Divisor
APR 79	3	53	1: 0	19:13		0.780
			19:14	25:14		0.860
			25:15	30:23		0.866
		54	1: 0	19:13		0.810
			19:14	25:14		0.930
			25:15	30:23		0.980
		55	1: 0	19:13		0.840
			19:14	25:14		0.870
			25:15	30:23		0.992
		56	1: 0	19:13		0.810
			19:14	25:14		0.930
			25:15	30:23		0.937
		57	1: 0	19:13		0.780
			19:14	25:14		0.860
			25:15	30:23		0.866
		64	1: 0	23: 0		0.940
		65	1: 0	23: 0		0.870
MAY 79	1	1	1: 0	31:23	75	
		5	1: 0	31:23	106604	
		6	1: 0	31:23	221111	
		7	1: 0	31:23	111111	
		8	1: 0	31:23	120200	
		9	1: 0	31:23	033010	
		79	1: 0	31:23	3333	
		84	22:14	31:23	33333	
MAY 79	2	6	1: [illegible]	31:23	231111	
		8	22:14	22:14	130311	
			22:15	31:23	130211	
		77	1: 0	8: 8	00	
			17:13	18: 8	11	
		84	16:11	16:11	14441	
			26: 9	26:19	11111	
			30:10	30:19	11111	
			31:12	31:18	11111	

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
MAY	79	3	53	1: 0	13:12		0.886
				13:13	22:13		0.818
				22:14	31:23		1.000
			54	1: 0	13:12		0.980
				13:13	22:13		0.908
				22:14	31:23		0.990
			55	1: 0	13:12		0.992
				13:13	22:13		0.923
				22:14	31:23		1.000
			56	1: 0	13:12		0.936
				13:13	22:13		0.869
				22:14	31:23		0.930
			57	1: 0	13:12		0.886
				13:13	22:13		0.818
				22:14	31:23		1.000
			64	8: 8	17:12		1.098
				22:14	31:23		0.944
			65	8: 8	17:12		1.034
				22:14	31:23		0.927
JUN	79	1	1	1: 0	30:23	75	
			5	1: 0	30:23	107604	
			6	1: 0	30:23	221111	
			7	1: 0	30:23	111111	
			8	1: 0	30:23	120200	
			9	1: 0	30:23	033010	
			79	1: 0	30:23	3333	
JUN	79	2	6	1: 0	30:23	231111	
			8	11: 0	23:23	130211	
			77	7:15	11: 9	11	
				13:17	14:10	11	
				28: 4	28: 4	11	
				28:11	30:23	33	
			78	7: 0	19:22	3333	
			84	1: 0	3:23	33333	
				16:12	16:12	44144	
				17: 1	17: 1	44144	
				20:13	20:19	11111	
				21:11	21:14	11111	
				28:15	28:15	14441	

Table B-1. (cont)

Month Year	Pass	Word	Start	Stop	Replacement	Divisor
JUN 79	3	6	7: 0	19:22	331111	
		53	1: 0	3:23		1.000
			5:11	19:22		0.951
			20: 9	30:23		0.987
		54	1: 0	3:23		0.990
			5:11	19:22		0.941
			20: 9	30:23		1.008
		55	1: 0	3:23		1.000
			5:11	19:22		0.971
			20: 9	30:23		1.003
		56	1: 0	3:23		0.930
			5:11	19:22		0.853
			20: 9	30:23		0.896
		57	1: 0	3:23		1.000
			5:11	19:22		0.951
			20: 9	30:23		0.987
		64	1: 0	7:14		0.944
			11:10	30:23		0.920
		65	1: 0	7:14		0.927
			11:10	30:23		0.955
		84	2:13	2:15	11111	
			3: 9	3:18	11111	
JUL 79	1	1	1: 0	31:23	75	
		5	1: 0	31:23	107604	
		6	1: 0	31:23	221111	
		7	1: 0	31:23	111111	
		8	1: 0	31:23	120200	
		9	1: 0	31:23	033010	
		79	1: 0	31:23	3333	
JUL 79	2	6	1: 0	31:23	231111	
		77	4: 0	4: 0	11	
			6:14	6:17	11	
			9:21	9:21	14	
			10:22	10:22	11	
			11:11	11:11	41	
			12: 9	12:11	41	
			12:12	12:14	14	
			14: 8	14:12	14	
			22:11	22:11	11	
			22:15	22:16	11	
			26:22	26:22	11	
			28:10	28:10	11	
		84	3:22	5:21	11111	
			26:22	26:22	14441	

Table B-1. (cont)

Month Year	Pass	Word	Start	Stop	Replacement	Divisor
JUL 79	3	53	1: 0	2:21		0.987
			5:22	27:15		1.078
			27:16	31:23		1.058
		54	1: 0	2:21		1.008
			5:22	27:15		1.093
			27:16	31:23		1.065
		55	1: 0	2:21		1.003
			5:22	27:15		1.086
			27:16	31:23		1.070
		56	1: 0	2:21		0.896
			5:22	27:16		0.967
			27:16	31:23		0.947
		57	1: 0	2:21		0.987
			5:22	27:15		1.078
			27:16	31:23		1.058
		64	1: 0	6:11		0.920
			6:18	31:23		0.998
		65	1: 0	6:11		0.955
			6:18	31:23		0.961
AUG 79	1	1	1: 0	31:23	75	
		5	1: 0	31:23	107604	
		6	1: 0	31:23	221111	
		7	1: 0	31:23	111111	
		8	1: 0	31:23	120200	
		9	1: 0	31:23	033010	
		79	1: 0	31:23	3333	

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
AUG	79	2	6	1: 0	31:23	231111	
			8	28:16	31:23	120011	
			77	5: 1	5: 2	11	
				5:19	5:19	14	
				10:23	10:23	41	
				12:12	12:12	41	
				16:10	16:11	11	
				24: 6	25:16	11	
				26: 9	27:14	11	
				28:15	31:23	00	
			78	24:16	24:16	1111	
				27: 6	27: 9	1111	
			84	5: 2	5: 2	11111	
				5:15	5:19	11111	
				6:11	6:16	11111	
				7:13	7:15	11111	
				12:14	12:14	44144	
				13:12	13:12	11111	
				14:12	14:19	11111	
				17: 9	17:15	11111	
				18: 9	18:18	11111	
				19:12	19:17	11111	
				22:11	22:17	11111	
				23:12	23:12	11111	
				24: 4	25:16	11111	
				27:22	27:22	11111	
				29:12	31:23	11111	
AUG	79	3	53	1: 0	29:12		1.058
			54	1: 0	29:12		1.065
			55	1: 0	29:12		1.070
			56	1: 0	29:12		0.949
			57	1: 0	29:12		1.058
			64	1: 0	28:15		0.998
			65	1: 0	28:15		0.961
SEP	79	1	1	1: 0	30:23	75	
			5	1: 0	30:23	108604	
			6	1: 0	30:23	221111	
			7	1: 0	30:23	111111	
			8	1: 0	30:23	120200	
			9	1: 0	30:23	033010	
			79	1: 0	30:23	3333	

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
SEP	79	2	6	1: 0	30:23	231111	
			8	1: 0	18:14	120011	
				26: 1	28: 5	120011	
				28: 6	30:23	130011	
			77	1: 0	18:14	00	
				18:19	18:19	41	
				26: 1	30:23	00	
			84	1: 0	2:19	11111	
				4:16	4:16	14441	
				6: 4	7: 9	11111	
				8:13	8:15	11111	
				18:10	18:10	41444	
				20: 7	20:10	11111	
				22:17	22:17	11111	
				23:11	23:17	11111	
				25:14	25:17	11111	
				26:10	26:14	11111	
				28: 5	30:23	33333	
SEP	79	3	53	1: 0	28: 4		0.980
				28: 5	30:23		1.054
			54	1: 0	28: 4		0.999
				28: 5	30:23		1.065
			55	1: 0	28: 4		1.018
				28: 5	30:23		1.070
			56	1: 0	28: 4		0.877
				28: 5	30:23		0.934
			57	1: 0	28: 4		0.980
				28: 5	30:23		1.054
			64	18:14	26: 0		1.112
			65	18:14	26: 0		1.127
OCT	79	1	1	1: 0	31:23	75	
			5	1: 0	31:23	108604	
			6	1: 0	31:23	221111	
			7	1: 0	31:23	111111	
			8	1: 0	31:23	120200	
			9	1: 0	31:23	033010	
			79	1: 0	31:23	3333	
OCT	79	2	6	1: 0	31:23	231111	
			8	1: 0	12:10	100011	
			77	12:11	12:15	33	
				12:16	12:16	31	
				12:17	15: 9	33	
				15:10	15:10	11	
			84	1: 0	1: 7	33333	
				1: 8	12:10	11111	
				12:11	15: 9	33333	
				15:10	16: 9	11111	

Table B-1. (cont)

Month Year	Pass	Word	Start	Stop	Replacement	Divisor
OCT 79	3	53	1: 0	1: 7		1.054
			12: 8	15:10		0.647
			16: 9	22: 4		1.001
			22: 5	26: 9		1.093
			29:10	31:23		0.994
		54	1: 0	1: 7		1.065
			12: 8	15:10		0.656
			16: 9	22: 4		1.027
			22: 5	26: 9		1.064
			29:10	31:23		1.044
		55	1: 0	1: 7		1.070
			12: 8	15:10		0.670
			16: 9	22: 4		1.040
			22: 5	26: 9		1.082
			29:10	31:23		1.047
		56	1: 0	1: 7		0.934
			12: 8	15:10		0.713
			16: 9	22: 4		0.893
			22: 5	26: 9		0.970
			29:10	31:23		0.894
		57	1: 0	1: 7		1.054
			12: 8	15:10		0.647
			16: 9	22: 4		1.001
			22: 5	26: 9		1.093
			29:10	31:23		0.994
		64	12: 8	15:10		0.797
			15:15	22: 4		1.053
			22: 5	26: 9		1.179
			29:10	31:23		1.044
		65	12: 8	15:10		0.812
			15:15	22: 4		1.090
			22: 5	26: 9		1.138
			29:10	31:23		1.058
NOV 79	1	1	1: 0	30:23	75	
		5	1: 0	30:23	108604	
		6	1: 0	30:23	221111	
		7	1: 0	30:23	111111	
		8	1: 0	30:23	120200	
		9	1: 0	30:23	033010	
		79	1: 0	12:12	3333	
NOV 79	2	6	1: 0	12:12	231111	
			12:13	30:23	201111	
		77	2:13	2:13	11	
			2:22	3: 2	11	
			5: 5	5: 5	11	
			6:21	6:21	41	
			14: 6	14: 8	41	
			17: 3	17: 3	14	
			27: 1	27: 1	14	
		79	12:14	30:23	0000	
		84	27:16	27:17	11111	
			28: 6	28:11	11111	

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
NOV	79	3	53	1: 0	28: 5		0.996
				28:12	30:23		0.990
			54	1: 0	28: 5		1.044
				28:12	30:23		1.051
			55	1: 0	28: 5		1.047
				28:12	30:23		1.030
			56	1: 0	28: 5		0.894
				28:12	30:23		0.941
			57	1: 0	28: 5		0.994
				28:12	30:23		0.990
			64	1: 0	30:23		1.044
			65	1: 0	30:23		1.058
DEC	79	1	1	1: 0	31:23	75	
			5	1: 0	31:23	109604	
			6	1: 0	31:23	221111	
			7	1: 0	31:23	111111	
			8	1: 0	31:23	120200	
			9	1: 0	31:23	033010	
			79	1: 0	31:23	0000	
DEC	79	2	6	1: 0	31:23	201111	
			8	12: 2	13: 8	120311	
				20: 2	22:10	120311	
				23:19	25: 9	120311	
			77	12: 2	13: 8	33	
				20: 2	22:10	33	
				23:19	25: 9	33	
DEC	79	3	53	1: 0	31:23		0.990
			54	1: 0	31:23		1.051
			55	1: 0	31:23		1.030
			56	1: 0	31:23		0.941
			57	1: 0	31:23		0.990
			64	1: 0	31:23		1.001
			65	1: 0	31:23		1.034
JAN	80	1	1	1: 0	31:23	75	
			5	1: 0	31:23	109604	
			6	1: 0	31:23	221111	
			7	1: 0	31:23	111111	
			8	1: 0	31:23	120200	
			9	1: 0	31:23	033010	

Table B-1. (cont)

Month	Year	Pass	Word	Start	Stop	Replacement	Divisor
JAN	80	2	6	1: 0	8: 8	201111	
			8	1: 0	31:23	120311	
			77	1: 0	31:23	33	
			79	1: 0	8: 8	0000	
			84	2:11	7: 8	11111	
				11: 9	11: 9	44144	
				11:10	22: 0	33333	
				22:20	22:20	11111	
				27:14	27:15	11111	
				30:23	31:23	11111	
JAN	80	3	53	7: 9	11: 9		1.020
				11:10	30:23		0.849
			54	7: 9	11: 9		0.980
				11:10	30:23		0.884
			55	7: 9	11: 9		0.960
				11:10	30:23		0.914
			56	7: 9	11: 9		0.950
				11:10	30:23		0.777
			57	7: 9	11: 9		1.020
				11:10	30:23		0.849
			64	1: 0	31:23		1.007
			65	1: 0	31:23		1.034
FEB	80	1	1	1: 0	29:23	75	
			5	1: 0	29:23	109604	
			6	1: 0	29:23	221111	
			7	1: 0	29:23	111111	
			8	1: 0	29:23	120200	
			9	1: 0	29:23	033010	
FEB	80	2	77	10:17	11: 9	11	
			78	4:14	4:14	1111	
				10:17	11: 9	1111	
			79	10:17	11: 9	1111	
				24: 6	25: 8	1111	
			84	1: 0	6: 8	11111	
				10:17	11: 9	11111	
				21:13	21:15	11111	
				22:10	22:16	11111	
				23:12	23:17	11111	
				27:12	27:13	11111	
				29:12	29:12	11111	
				29:14	29:14	11111	

Table B-1. (cont)

Month Year	Pass	Word	Start	Stop	Replacement	Divisor
FEB 80	3	53	1: 0	29:23		0.904
		54	1: 0	29:23		0.910
		55	1: 0	29:23		0.946
		56	1: 0	29:23		0.819
		57	1: 0	29:23		0.904
		64	1: 0	13: 4		1.007
			13: 5	28: 3		1.138
			28: 4	29:23		0.982
		65	1: 0	13: 4		1.034
			13: 5	28: 3		1.125
			28: 4	29:23		1.022
MAR 80	1	1	1: 0	31:23	75	
		5	1: 0	31:23	109603	
		6	1: 0	31:23	221111	
		7	1: 0	31:23	111111	
		8	1: 0	31:23	120200	
		9	1: 0	31:23	033010	
MAR 80	2	79	14: 9	14: 9	1111	
			21:14	21:14	1111	
			28:10	31: 8	1111	
		84	1:10	1:14	11111	
			2: 8	2: 9	11111	
			2:17	2:20	11111	
			23: 9	24:13	11111	
MAR 80	3	53	1: 0	4:15		0.838
			5:10	23: 8		0.905
			24:14	31:23		0.939
		54	1: 0	4:15		0.874
			5:10	23: 8		0.878
			24:14	31:23		0.973
		55	1: 0	4:15		0.911
			5:10	23: 8		0.919
			24:14	31:23		0.961
		56	1: 0	4:15		0.767
			5:10	23: 8		0.818
			24:14	31:23		0.909
		57	1: 0	4:15		0.838
			5:10	23: 8		0.905
			24:14	31:23		0.938
		64	1: 0	4:15		0.959
			5:10	31:23		1.062
		65	1: 0	4:15		1.031
			5:10	31:23		1.073

Table B-2. Summary of Goodness of Fit after Calibration. For each Month, the First Line Gives the Average of the Ratios of the Measured to the Calculated Transmittances for the Points with Visibility Greater Than 20 KM if There Are 10 KM. The Second Line Gives the Standard Deviation Around the Average and the Third Line Gives the Number of Points Used in the Average (A * Indicates That Points with Visibility Greater Than 10 KM were Used)

Month	************ 500	M	**********	** 1500	M **
	3-5	8-12	8-13	4	3-5	8-12
			1978			
Sept.	0.996 0.015 175*	1.001 0.012 177*	1.000 0.012 178*	1.005 0.018 173*	1.005 0.030 43*	1.017 0.032 43*
Oct.	0.988 0.015 83	0.996 0.020 83	0.993 0.020 84	0.995 0.030 84	1.002 0.023 115	1.002 0.024 113
Nov.	1.001 0.016 64	1.005 0.011 65	0.998 0.012 65	1.005 0.019 63	0.996 0.029 62	0.999 0.026 64
Dec.	1.002 0.016 28	1.000 0.040 33	1.000 0.048 37	1.000 0.024 29	1.003 0.017 25	1.005 0.012 22
			1979			
Jan.	(No Points With Visibility Greater Than 10 km)					
Feb.	0.903 0.063 18*	0.922 0.057 19*	0.931 0.057 18*	0.933 0.052 19*	1.004 0.028 19*	1.005 0.020 18*
March	0.991 0.017 72	0.998 0.020 71	1.000 0.017 72	1.002 0.024 72	1.007 0.030 45	1.003 0.036 45
April	1.004 0.031 43	0.998 0.023 41	0.998 0.021 41	0.984 0.024 43	0.991 0.022 20	1.011 0.031 21

Table B-2. (cont.) Summary of Goodness of Fit after Calibration

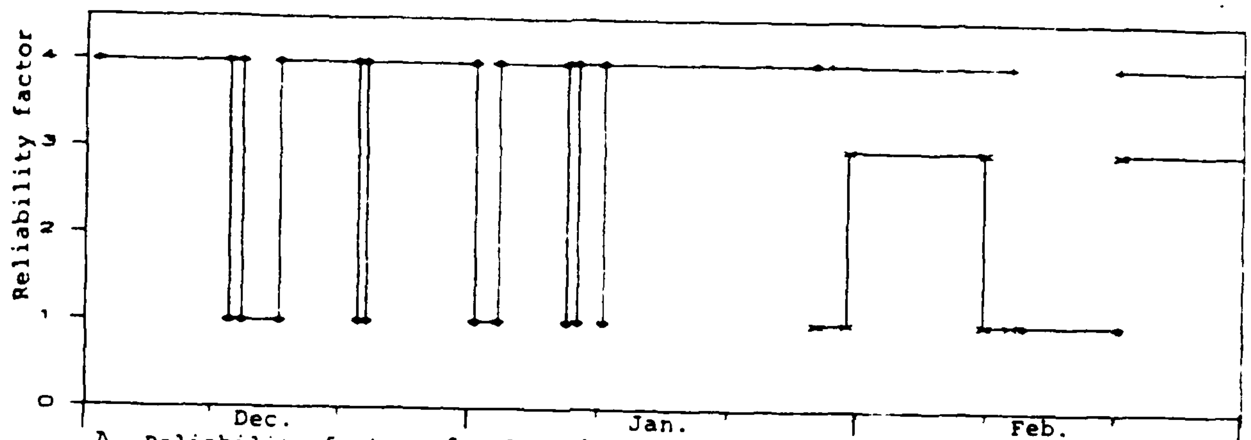
Month	************ 500 M	**********			** 1500 M **	
	3-5	8-12	8-13	4	3-5	8-12
May	0.994	0.995	0.996	0.991	1.000	1.002
	0.029	0.027	0.024	0.032	0.022	0.026
	87	89	87	86	57	51
June	0.997	1.000	0.995	0.996	0.949	0.983
	0.015	0.017	0.016	0.021	0.041	0.026
	20	20	20	20	12	14
July	0.999	0.999	1.000	0.999	0.999	1.001
	0.015	0.016	0.014	0.019	0.024	0.030
	145	145	147	144	145	144
Aug.	0.991	0.999	0.994	0.994	0.993	0.999
	0.025	0.021	0.024	0.029	0.029	0.029
	91	86	90	87	75	81
Sept.	1.015	1.016	1.011	1.015	0.996	1.001
	0.024	0.017	0.017	0.029	0.019	0.024
	60	58	59	61	15	16
Oct.	0.998	1.001	0.999	0.996	0.988	1.001
	0.015	0.015	0.012	0.019	0.039	0.027
	38	38	38	37	38	37
Nov.	1.001	0.988	0.999	1.002	1.000	1.000
	0.015	0.017	0.013	0.018	0.029	0.020
	74	74	74	74	73	74
Dec.	0.994	0.996	0.997	0.988	0.981	0.999
	0.046	0.022	0.021	0.045	0.044	0.028
	84	85	86	80	72	74
			1980			
Jan.	1.000	1.003	1.006	1.001	1.003	0.994
	0.040	0.020	0.022	0.046	0.058	0.054
	33	32	32	32	32	38
Feb.	1.000	1.001	1.001	0.999	0.998	1.003
	0.057	0.015	0.017	0.063	0.035	0.027
	43*	41*	42*	41*	66*	65*
March	1.000	0.998	0.998	0.998	0.997	0.995
	0.025	0.021	0.018	0.027	0.050	0.034
	63	61	62	64	71	69

APPENDIX C

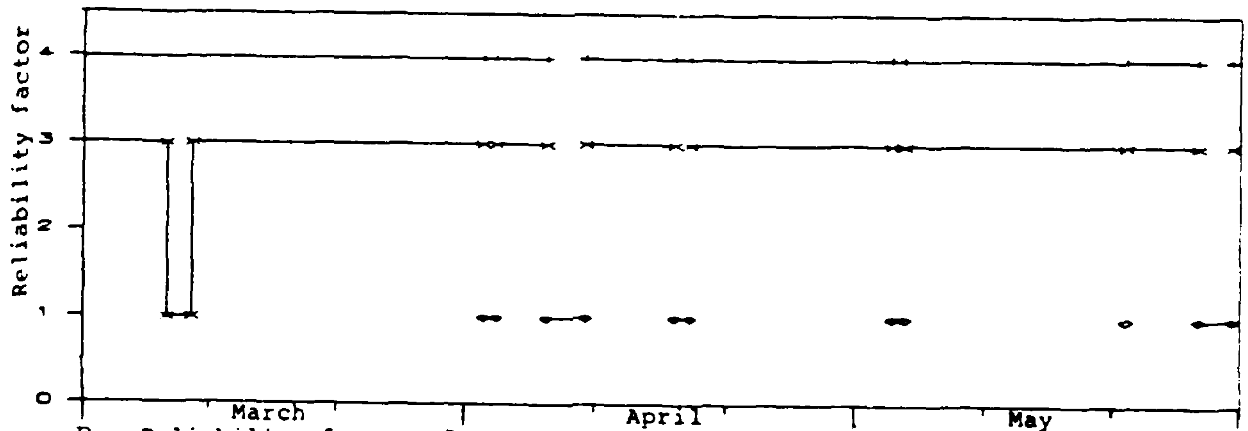
DATA AVAILABILITY

The figures in this appendix show graphically the availability and reliability of the visible and the IR transmittance data and the factors used to calibrate the IR transmittances. The definitions of the reliability factors are given in Table 2. The calibration factors are the values which have been divided into the raw IR transmittances to produce the calibrated transmittances.

The data are grouped by season except for the last period which includes the four months from Dec. 1979 through March 1980. Changes in the factors of less than 6 hours are not indicated.

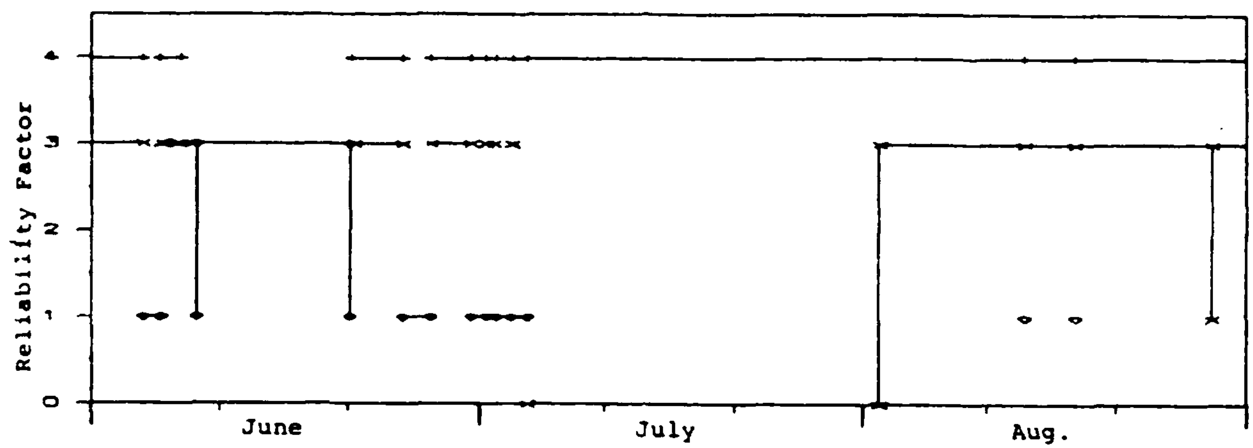


A. Reliability factors for December 1978--February, 1979.

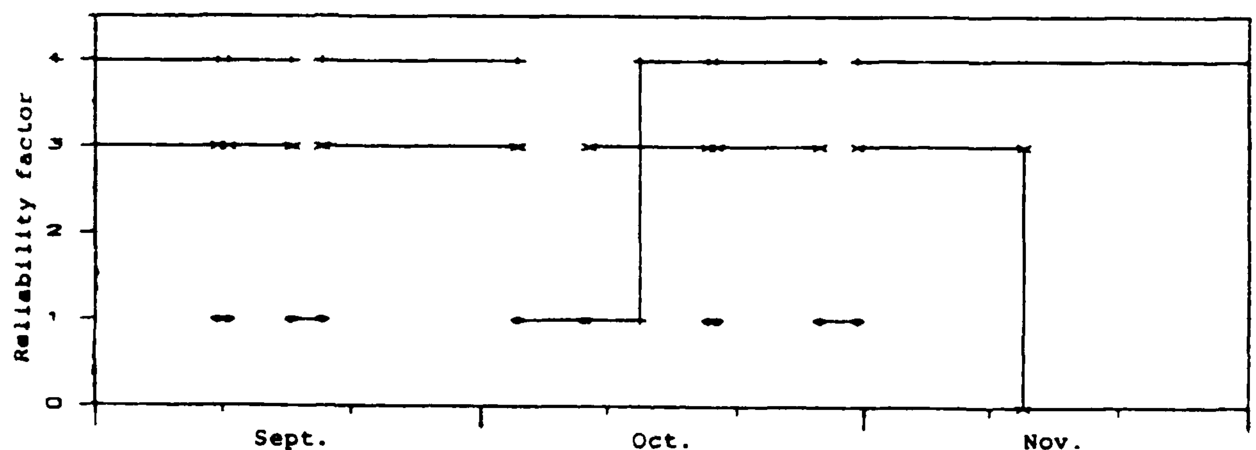


B. Reliability factors for March--May, 1979.

Figure C-1. Reliability Factors for the Eltro Visible Transmissometer (x) and the AEG Point Visibility Meter (+), (◊ = both units): A. Dec. 1978 to Feb. 1979, B. March 1979 to May 1979



C. Reliability factors for June--August, 1979.



D. Reliability factors for September--November, 1979.

Figure C-1. Reliability Factors for the Eltro Visible Transmissometer (x) and the AEG Point Visibility Meter (+), (◊ = both units): C. June 1979 to Aug. 1979, D. Sept. 1979 to Nov. 1979

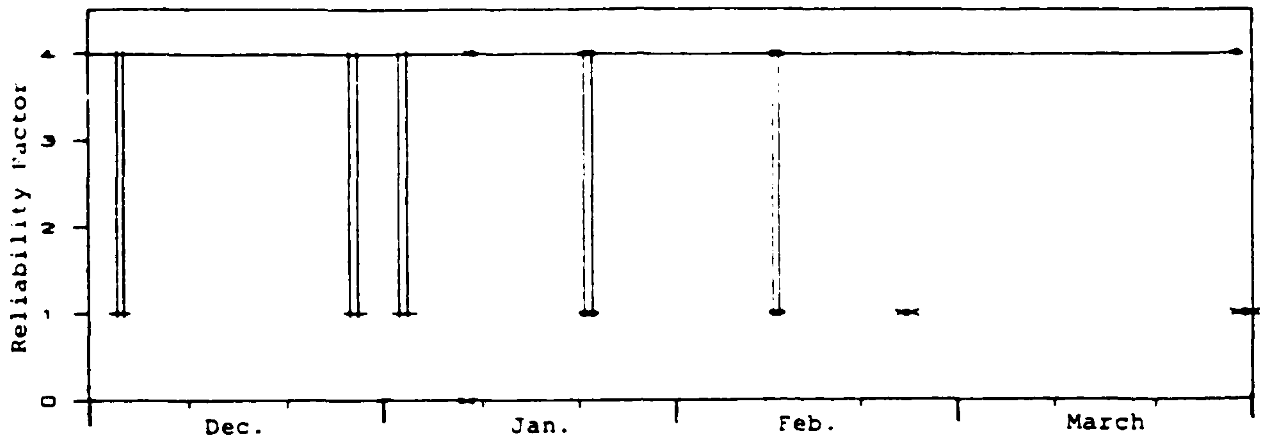


Figure C-1. Reliability Factors for the Eltro Visible Transmissometer (x) and the AEG Point Visibility Meter (+), (◊ + both units): E. Dec. 1979 to March 1980

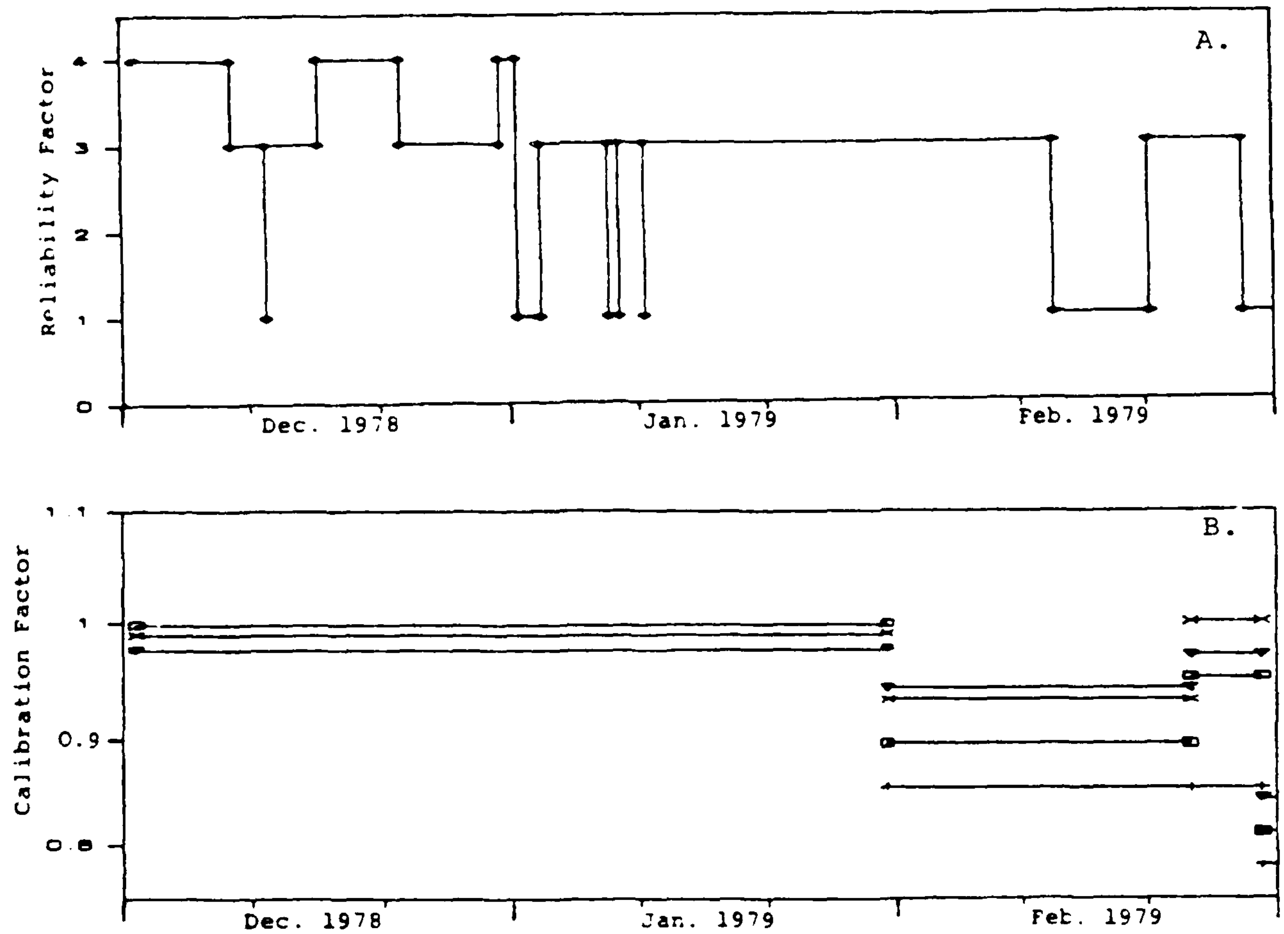


Figure C-2. (a) Reliability and (b) Calibration Factors for the 500 m Barnes Transmissometer for the Period Dec. 1978 to Feb. 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ∇ = 8-13 Micrometers, □ = 4 Micrometers, ◊ = All Channels)

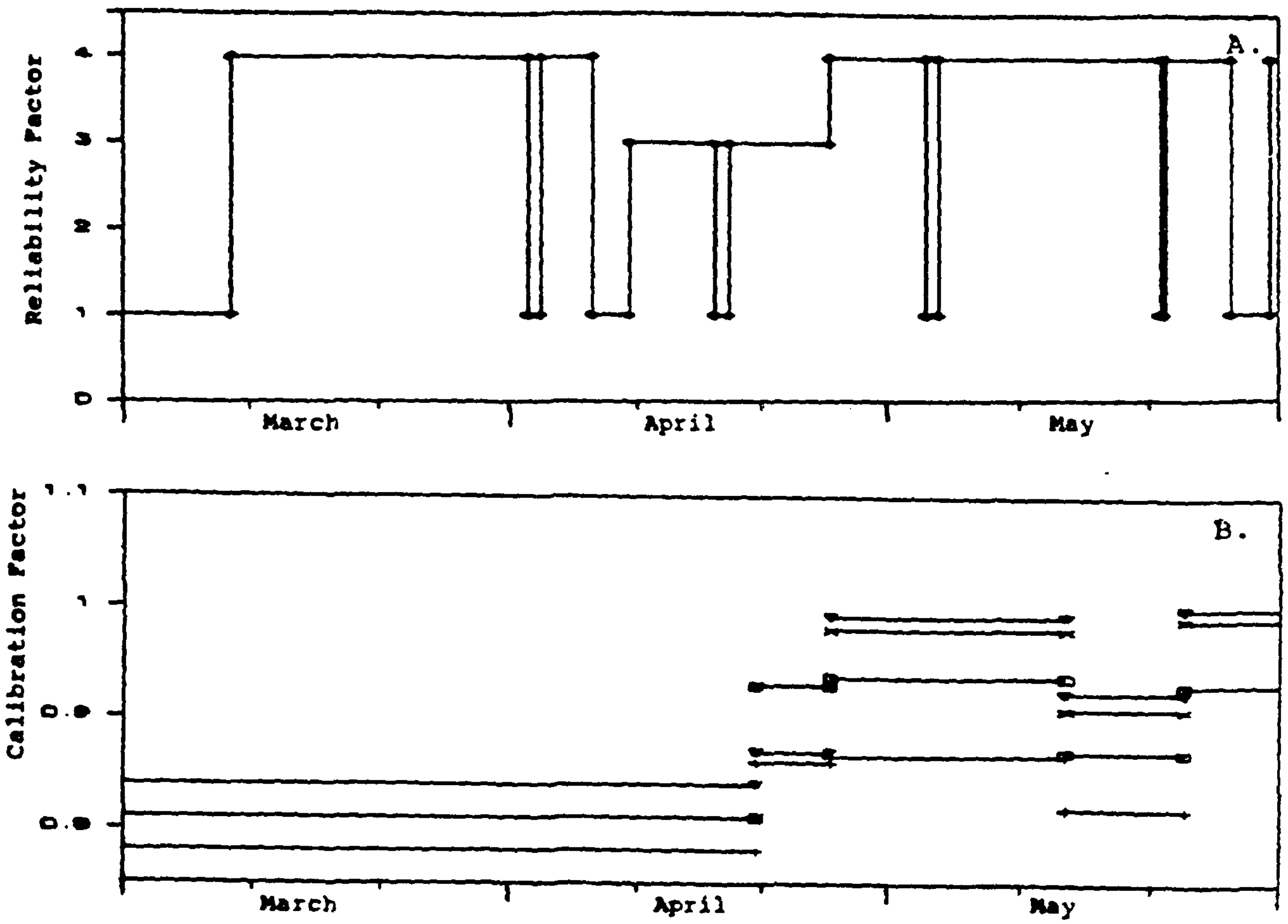


Figure C-3. (a) Reliability and (b) Calibration Factors for 500 m Barnes Transmissometer for the Period March 1979 to May 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ▽ = 8-13 Micrometers, □ = 4 Micrometers, ◊ = All Channels)

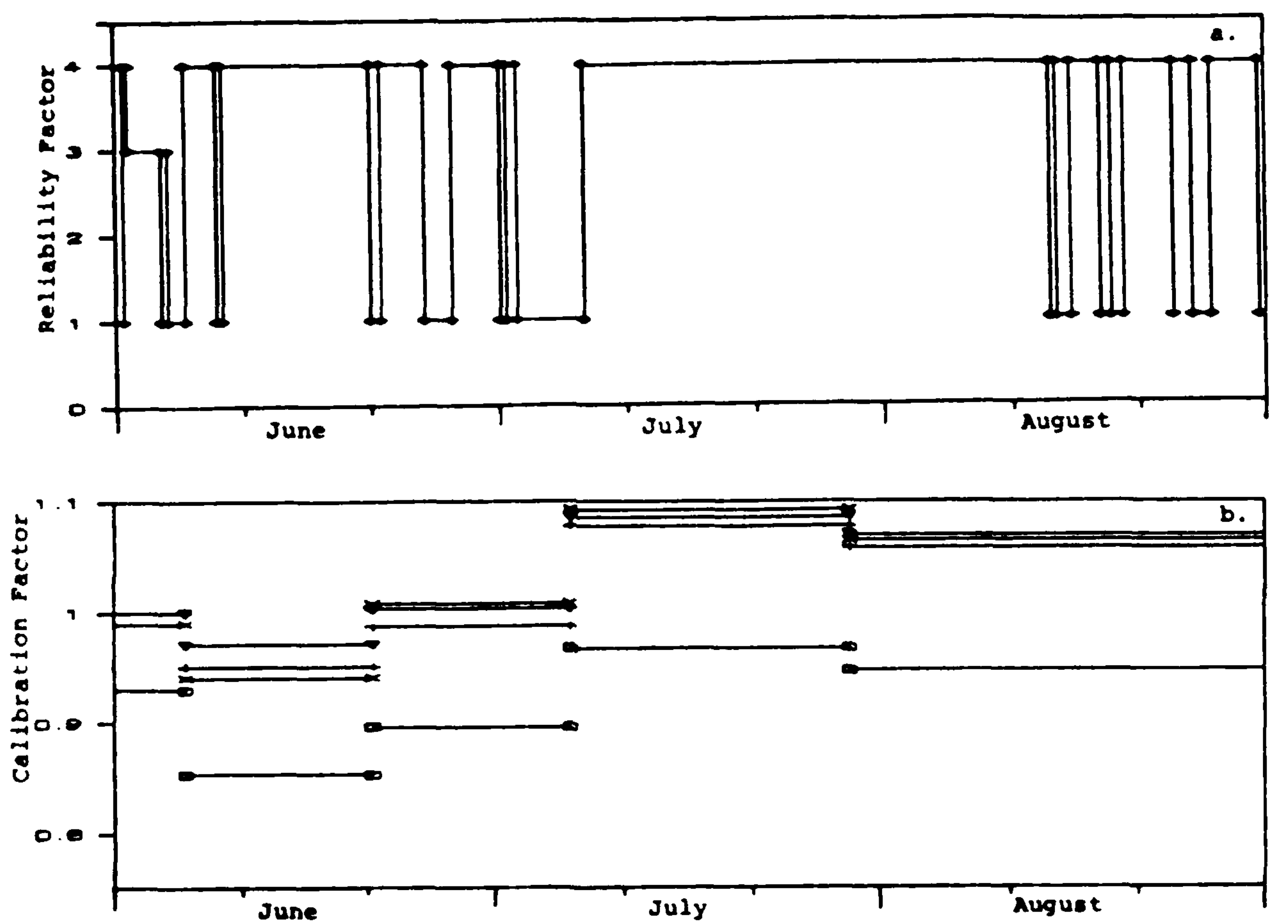


Figure C-4. (a) Reliability and (b) Calibration Factors for 500 m Barnes Transmissometer for the Period June, 1979 to Aug. 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ▽ = 8-13 Micrometers, □ = 4 Micrometers, ◊ = All Channels)

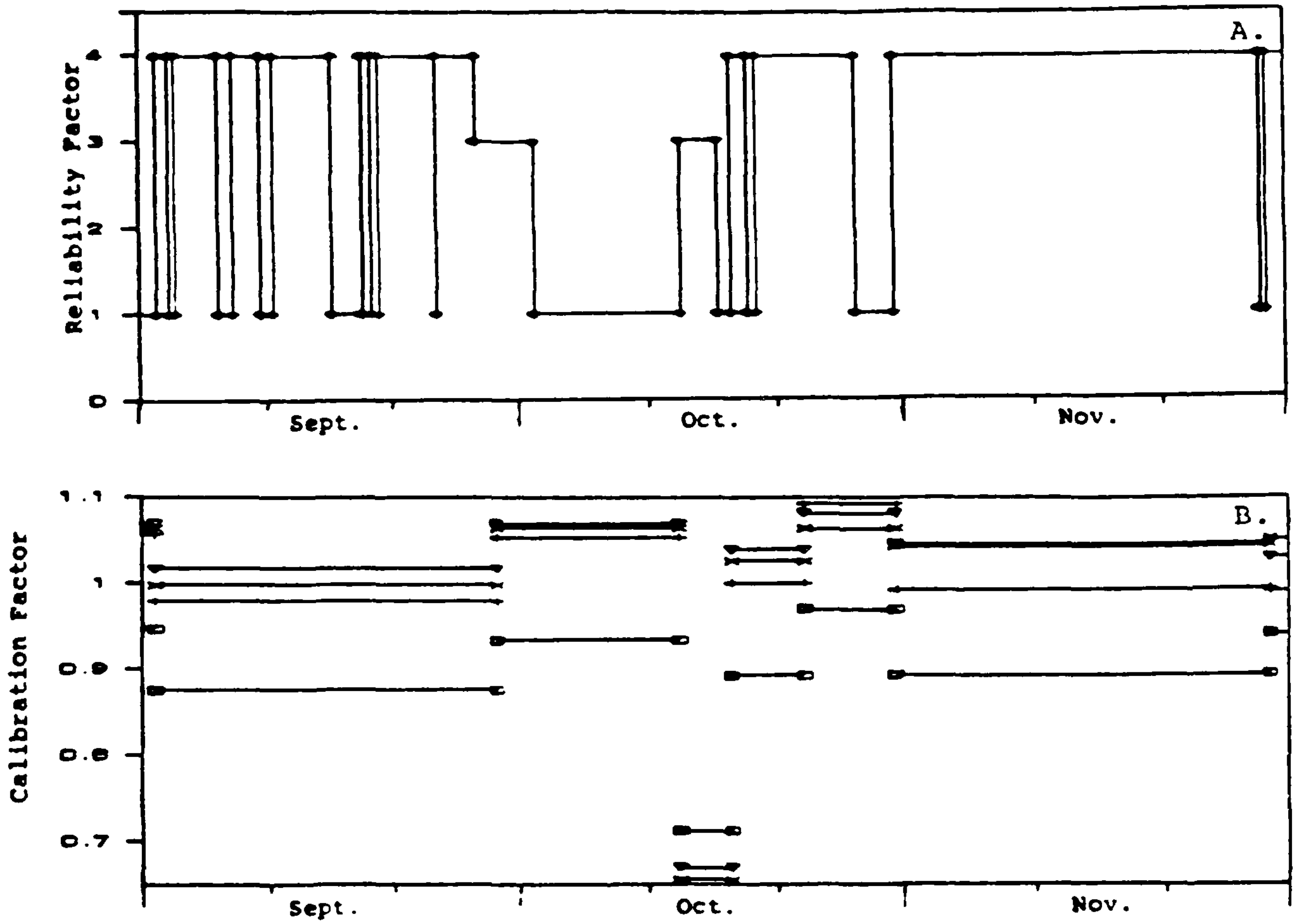


Figure C-5. (a) Reliability and (b) Calibration Factors for 500 m Barnes Transmissometer for the Period Sept. 1979 to Nov. 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ▽= 8-13 Micrometers, □= 4 Micrometers, ◊ = All Channels)

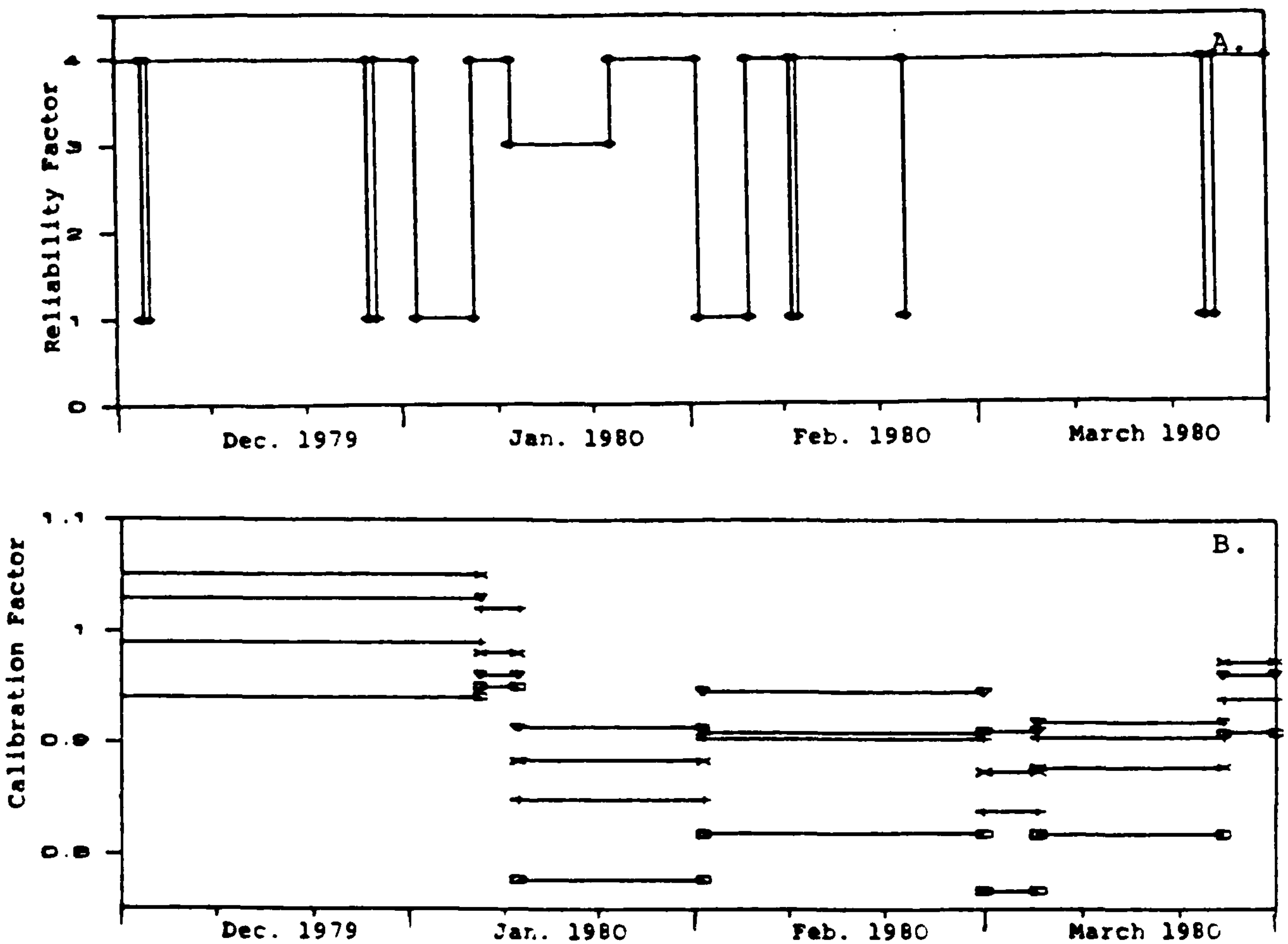


Figure C-6. (a) Reliability and (b) Calibration Factors for 500 m Barnes Transmissometer for the Period Dec. 1979 to March 1980

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ∇ = 8-13 Micrometers, □ = 4 Micrometers, ◊ = All Channels)

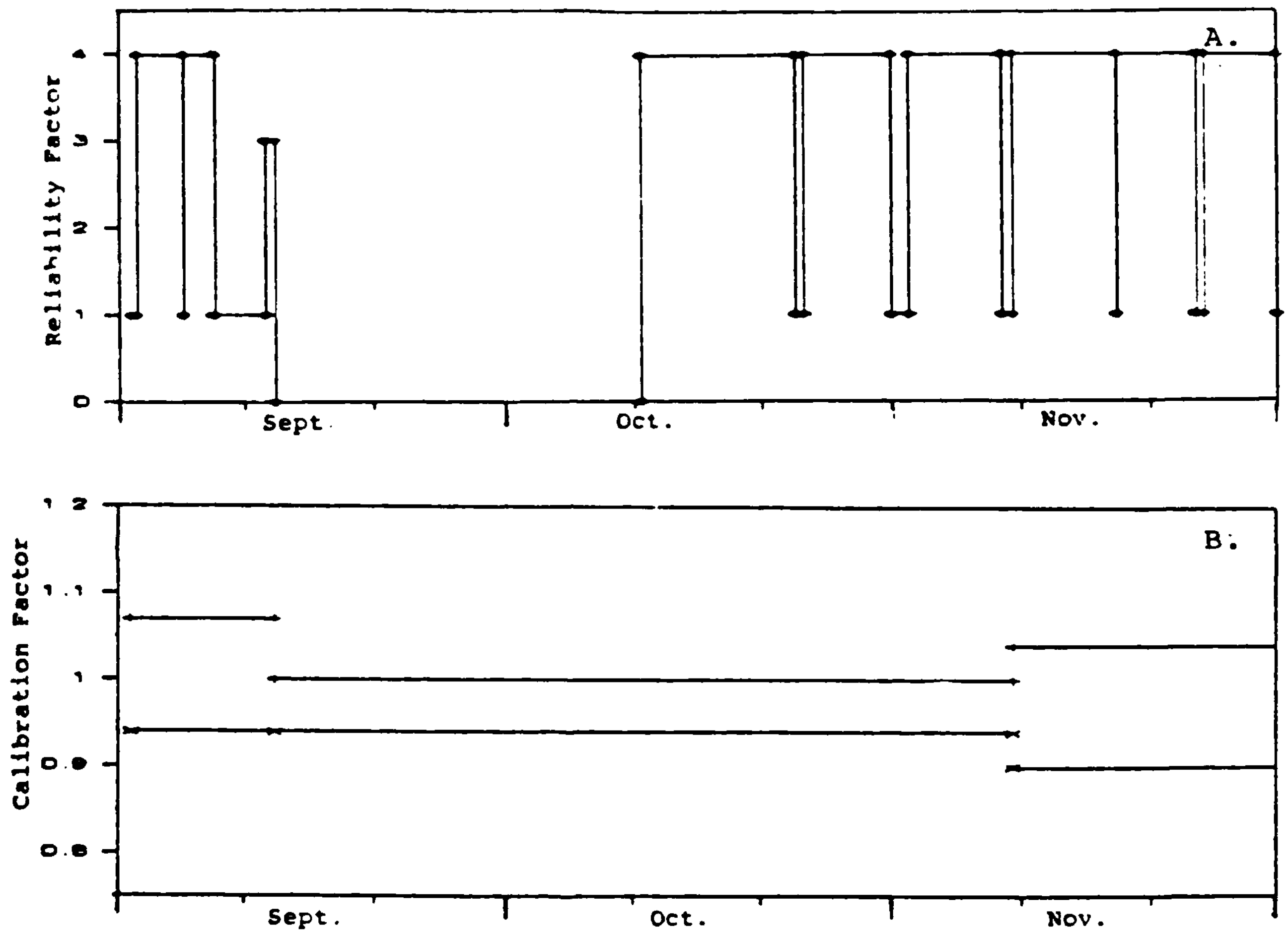


Figure C-7. (a) Reliability and (b) Calibration Factors for the 1400 m Barnes Transmissometer for the Period Sept. 1978 to Nov. 1978

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ∇ = 8-13 Micrometers, □ = 4 Micrometers, ◊ = All Channels)

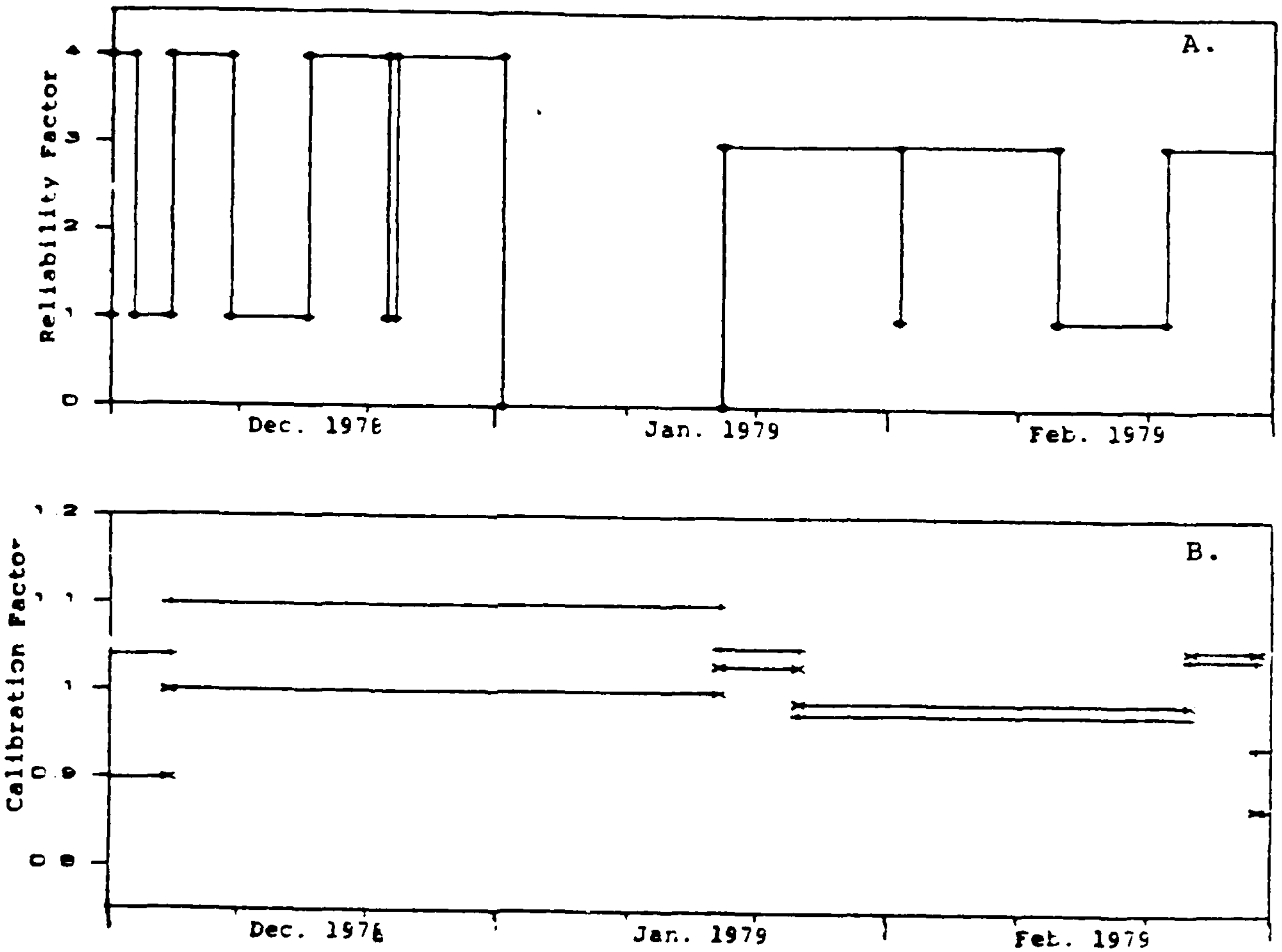


Figure C-8. (a) Reliability and (b) Calibration Factors for the 1400 m Barnes Transmissometer for the Period Dec. 1978 to Feb. 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ∇ = 8-13 Micrometers, □ = 4 Micrometers, ◊ = All Channels)

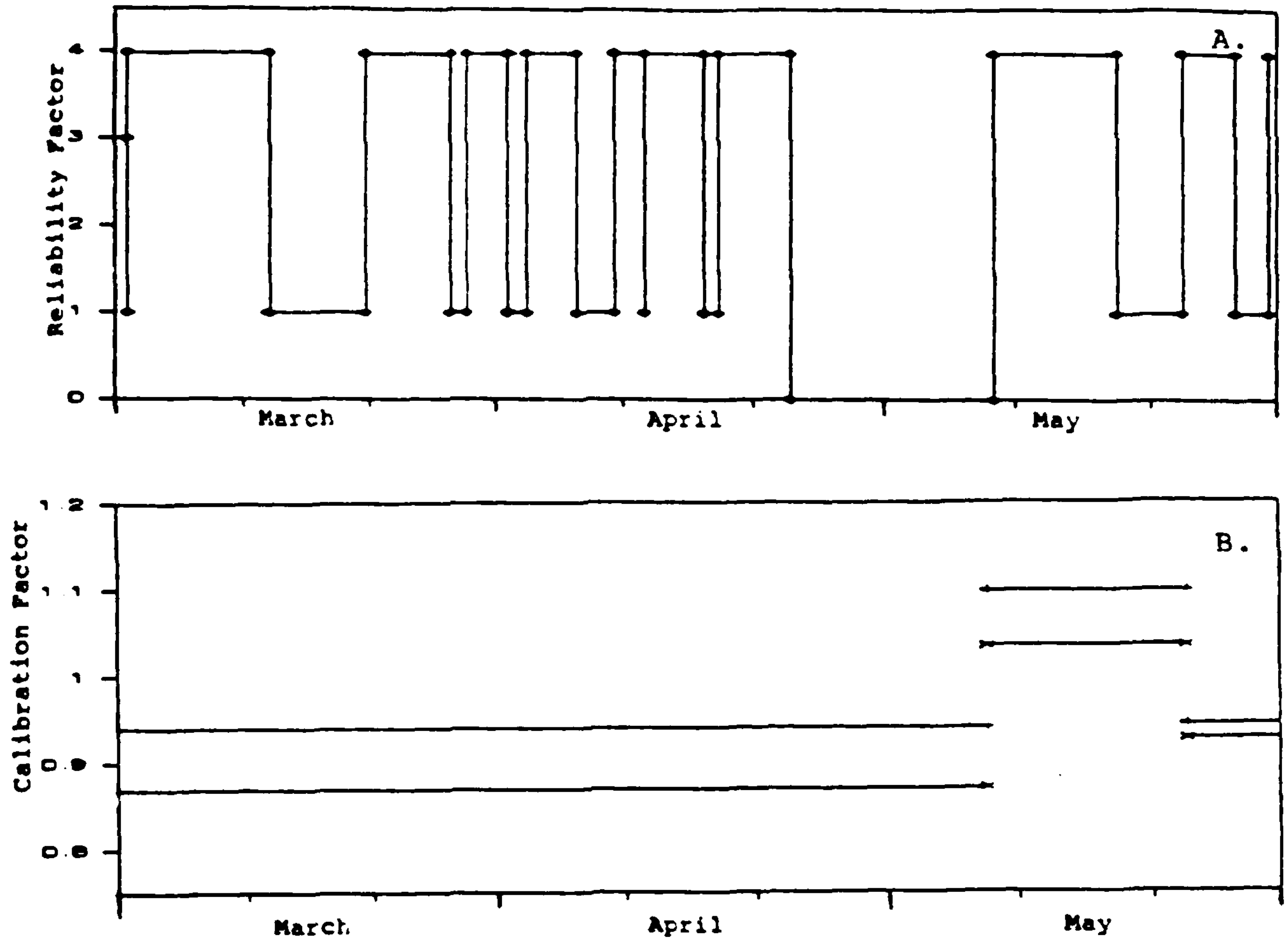


Figure C-9. (a) Reliability and (b) Calibration Factors for the 1400 m Barnes Transmissometer for the Period March 1979 to May 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ∇= 8-13 Micrometers, □= 4 Micrometers, ◊= All Channels)

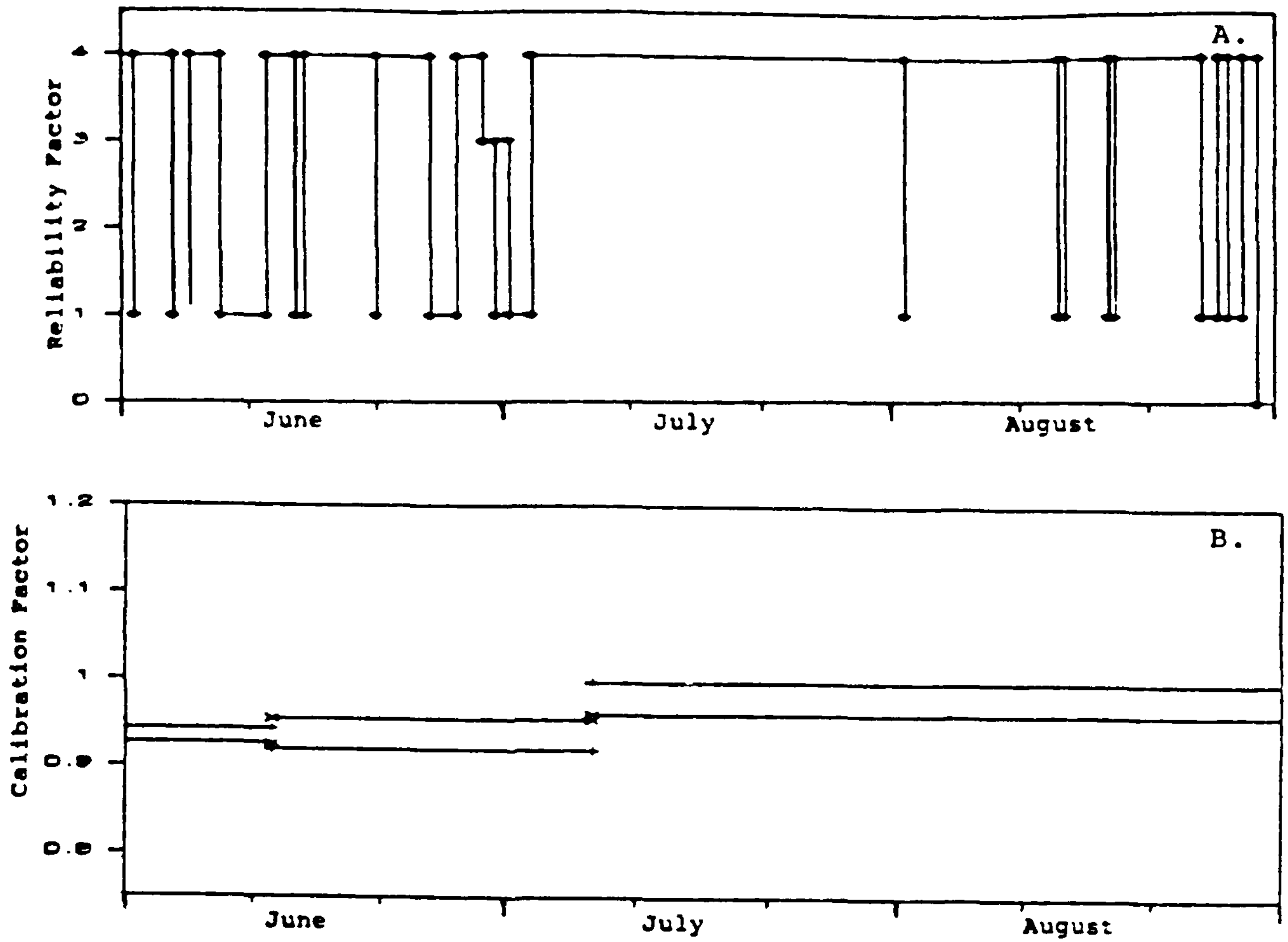


Figure C-10. (a) Reliability and (b) Calibration Factors for the 1400 m Barnes Transmissometer for the Period June 1979 to Aug. 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, ▽ = 8-13 Micrometers; □ = 4 Micrometers, ◊ = All Channels)

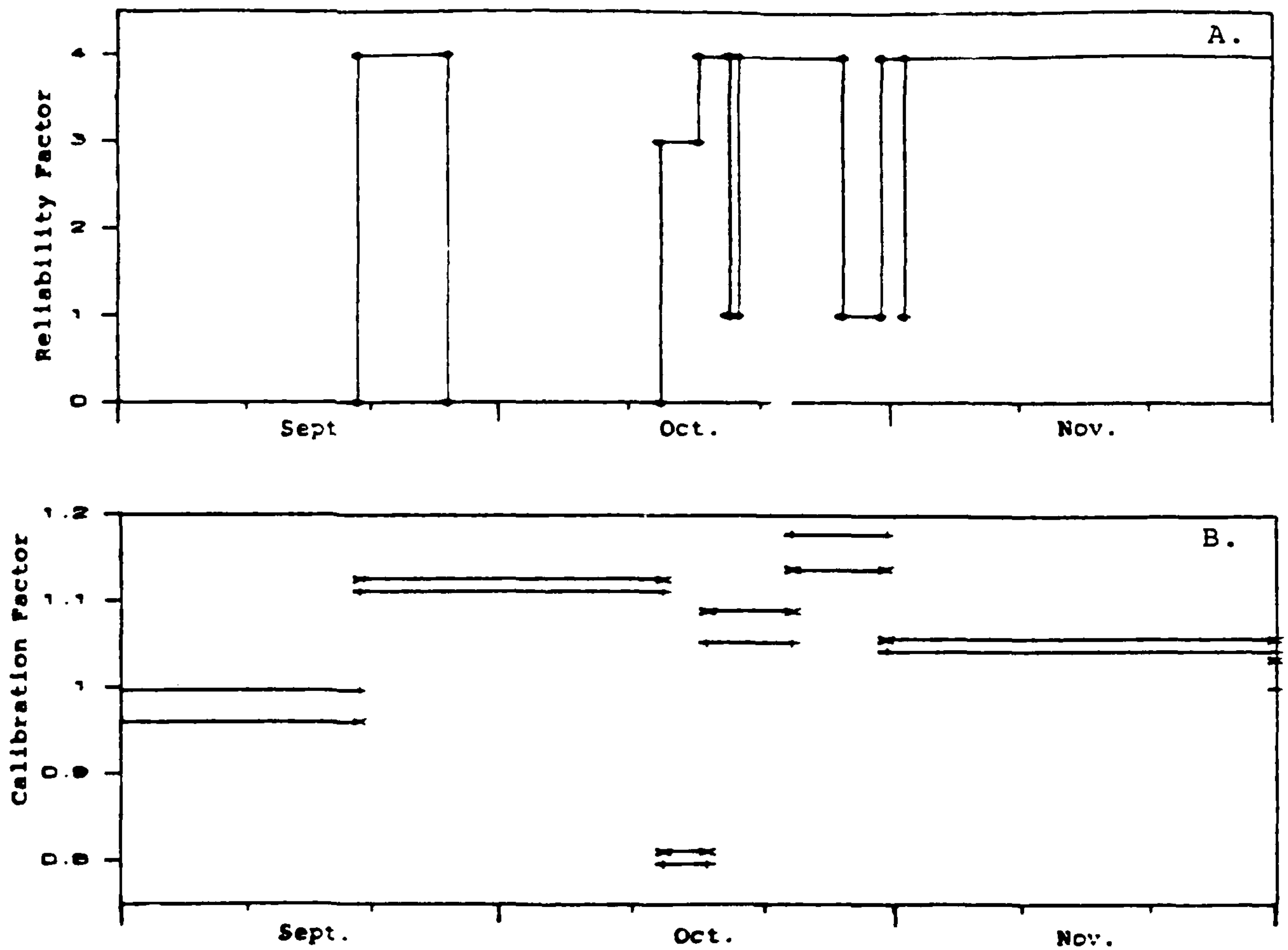


Figure C-11. (a) Reliability and (b) Calibration Factors for the 1400 m Barnes Transmissometer for the Period Sept. 1979 to Nov. 1979

(+ = 3-5 Micrometers, x = 8-12 Micrometers, = 8-13 Micrometers, = 4 Micrometers, = All Channels)

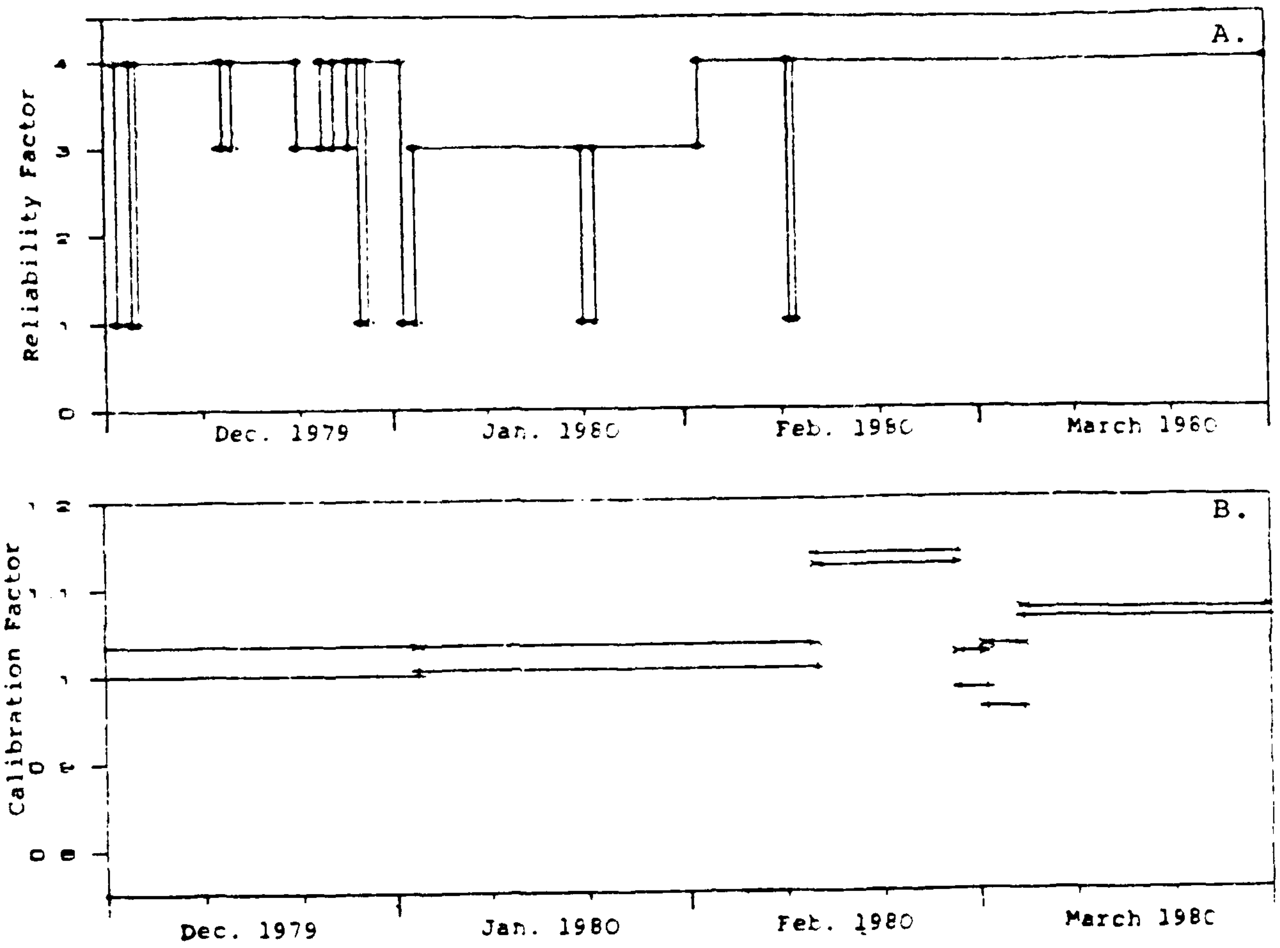


Figure C-12. (a) Reliability and (b) Calibration Factors for the 1400 m Barnes Transmissometer for the Period Dec. 1979 to March 1980

(+ = 3-5 Micrometers, x = 8--12 Micrometers, ∇= 8-13 Micrometers, □= 4 Micrometers, ◊= All Channels)

END

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